EDITORIAL

THE Government's decision to allow two commercial TV channels to operate in Brisbane and Adelaide is interesting from many points of view.

One is that it contradicts the recommendations of the Broadcasting Control Board, which considered one commercial channel to be sufficient in each of these cities.

Thinking in this matter can be divided into long term and short term. Any company which commences a TV service must carefully consider both of these, for while the initial costs of setting up a station call for a great deal of capital and expenditure, followed probably by substantial losses, in the end the gains to the operators are assured.

Just where the short term and the long term view will merge depends almost entirely upon the rate at which TV will grow. Operators by now should have a fairly good idea of how soon they will receive returns from their investment.

Now the figures show very clearly that the overall TV growth in Australia, although it has had its ups and downs, is very rapid. It is reported to be faster than anywhere else in the world. To achieve half-a-million licences in about two years, which is the expected position at the end of this year, is beyond the anticipations of all but the most optimistic forecasters.

When looking to the future, therefore, we must bear in mind the fact that, even if an immediate case can be made for limiting the number of stations in the smaller capitals, Australia's advancement will soon put this viewpoint out of date.

If competent operators are available, willing to risk their money, and able to make a reasonable bid for success, it is difficult to refuse them the opportunity.

The same thinking applies to the granting of licences to centres other than capital cities. These should be allowed to proceed just as quickly as they can be absorbed.

The inevitability of close co-operation on a program level between TV stations, present and projected, is another matter well in the minds of all. Co-operative buying and distribution of features has proved essential to success overseas, as the obvious means of sharing heavy costs and facilitating distribution. Australian TV must draw heavily on overseas sources for program material, and a world-wide exchange of features must continue to expand as more and more countries build up their audiences to normal potential.

We may congratulate ourselves, too, on the standard which has been set throughout the TV industry. I am quite sure better pictures on an average are not available anywhere else. TV has an enormous future in this country, and we must allow it to expand to full stature as quickly as our economy will permit.

John Moyle

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RADIO ★★ TELEVISION AND HOBBIES

A NATIONAL MAGAZINE OF RADIO, TELEVISION HOBBIES AND POPULAR SCIENCE

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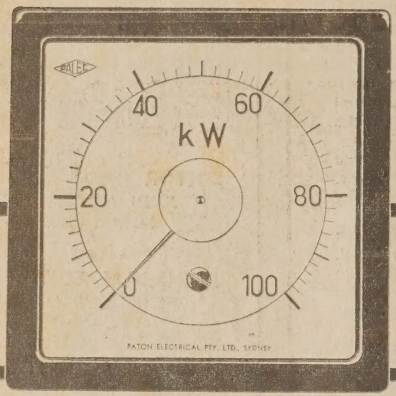

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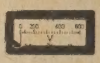
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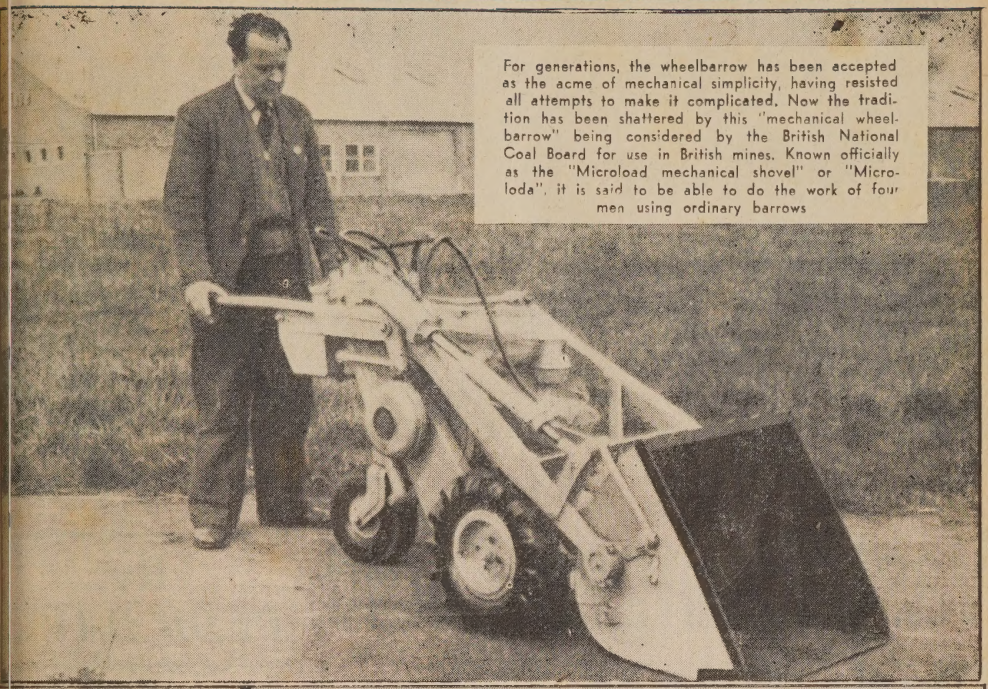
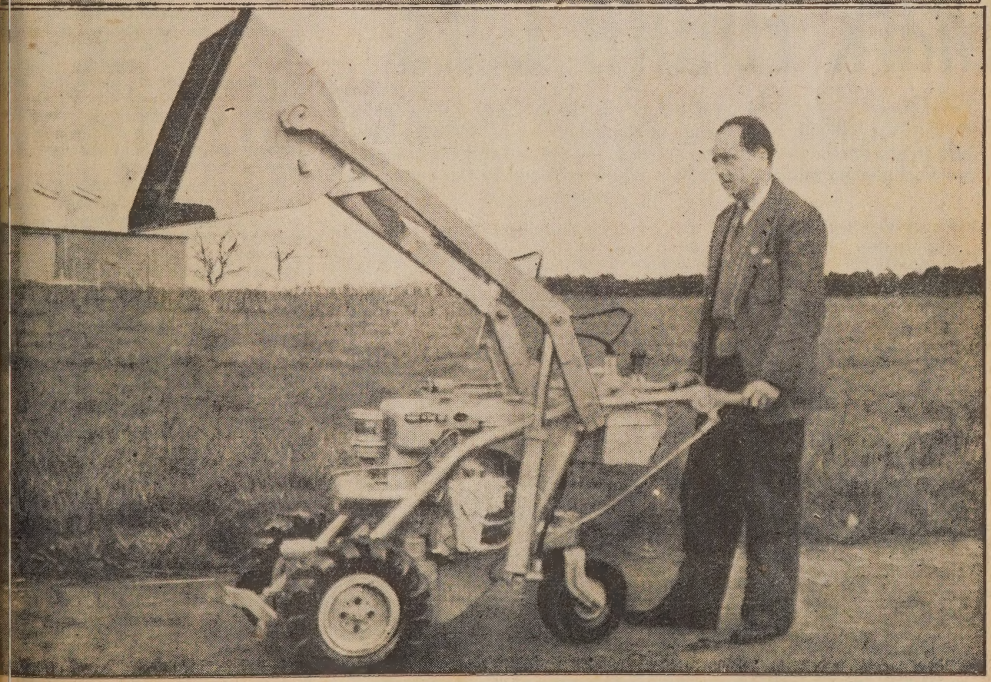
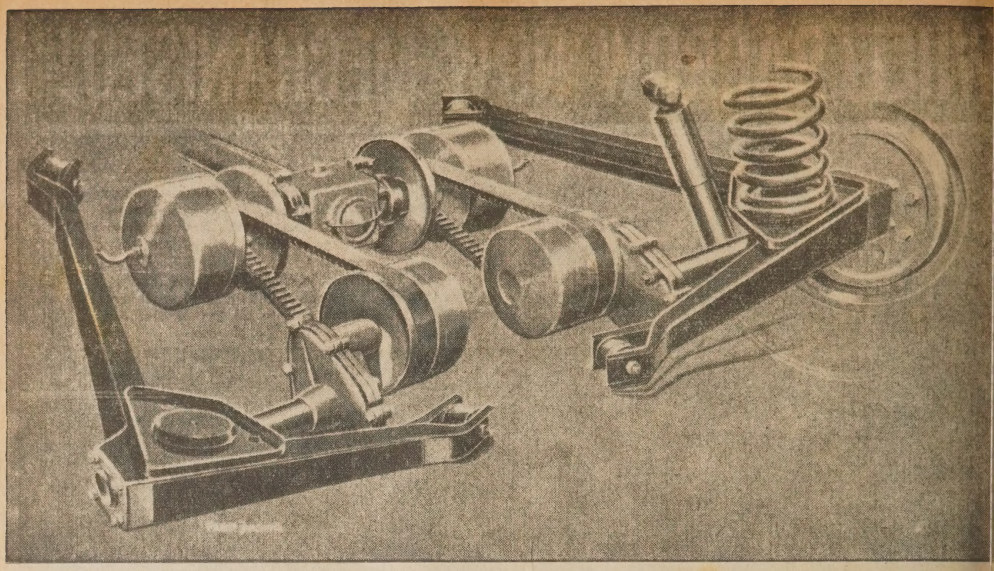
WHEELBARROW NOW MECHANISED!



For generations, the wheelbarrow has been accepted as the acme of mechanical simplicity, having resisted all attempts to make it complicated. Now the tradition has been shattered by this "mechanical wheelbarrow" being considered by the British National Coal Board for use in British mines. Known officially as the "Microload mechanical shovel" or "Microloda", it is said to be able to do the work of four men using ordinary barrows





Automatic transmission without the use of rear axle differential has been achieved by this ingenious device incorporated in th DAF design.

Vast Changes Could Mark Future Cars

Development in the automobile industry is rapid. Cars without gears or clutches, without metal spring suspension and even without wheels look to be commonplace before very long. This article takes a completely practical glimpse into the immediate future as shown by the pattern of the last few months.

By PEDR DAVIS

THE year 1958 has proved one of the most fruitful of all postwar years in the production of advanced automotive ideas.

A hitherto unknown Dutch firm — Van Doorme's Automobielfabriek — announced what is unquestionably the most interesting small car yet designed. The DAF, which is about to go into volume production following extensive tests, has numerous novel features. They include:

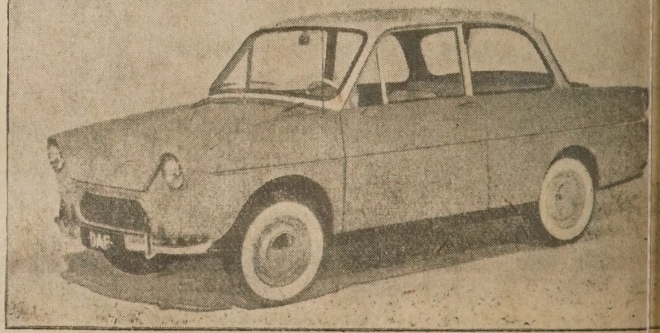
- Infinitely variable transmission.
- Final drive by cogged belts.
- No maintenance whatever, except oil changes.
- Room for four with an overall weight of 10¼ cwt.

The DAF is the first Dutch car to be built since the 1912 Spyker and it is a serious attempt at an entirely new concept of light car motoring. It is stylish in appearance, roomy and (according to the manufacturers) gives a maximum speed of 57 m.p.h. together with 48 m.p.g. fuel economy.

In all mechanical respects, the de is radical. No gear changes of any k are required and the cockpit has th controls a lever (marked Forw Neutral, Reverse) an accelerator an brake.

The transmission is comple original. It gives an infinite numbe forward ratios, without the use of slipping components.

Power is transmitted from the en to an automatically operated fric clutch, actuated by bob weights and i into the flywheel housing. Each of h rear wheels is suspended on a coil sp and is driven by a notched belt run



The DAF motor car—most revolutionary small car yet produced.

pulleys. Each pulley has two halves ch can slide in and out, thus altering effective diameter. Thus the various ing ratios depend entirely on the ey diameters.

he pulleys are varied by the action built-in contrifugal weights, supple-ited by engine vacuum pressure. The pulleys expand by overcoming ng pressure caused by the rotation of unit. The front ones are driven by engine, via a power divider. Each the rear pulleys is mounted on a ging half shaft which in turn is sup-ed by a triangular link and suspend-by a coil spring.

lthough the driving belts are notched, notches do not correspond with ves in the pulleys. They merely e it possible for small diameter pul-to be used without slipping.

he merits of this transmission lie in fact that it takes over the duties of the gearbox and the differential. e the two driving belts are independ-the unit gives the same effect as a n slip" differential.

he transmission is located between rear wheels under the floor and the ine is at the front, to keep the weight ribution of the car balanced.

Y CLEAN

n interesting point is that the V-belts o themselves clean, throwing off er, dust or grime centrifugally. The F engineers claim that elaborate s have convinced them there is no d to keep the driving belts covered, n during a downpour or on icy roads. he front suspension of the Dutch car lso original. The shock absorbers ch double up as king pins are fitted steering arms so that they turn with wheels. The result is that the turn-circle of the car is 27ft, the lowest record for a car of its size.

he engine, by the way, is a flat twin nder four stroke, air cooled. It de-ps 22 B.H.P. at 4,000 r.p.m. and has apacity of 600cc.

s dramatic as the DAF suspension been the widespread development of suspension systems during the past months.

ir suspension, of course, is nothing . Various ingenious systems have eared throughout automotive history, in 1936 the American Firestone pany produced a prototype unit sur-ingly similar to the one offered by roit today.

he significant point though is that the glish Dunlop firm and five American ms have announced new air suspen-n systems during the year.

he five U.S. firms are Buick, Nash, d, Chevrolet and Oldsmobile. They owed Cadillac, who introduced air spension for the limited production ugham late in 1956.

UNLOP SYSTEM

he Dunlop system (which is expect-to be offered on some British cars t year) consists of a small air com-ssor driven off the engine, an air rage tank, an air spring on each wheel elling valves and isolator valves. springs themselves are rubber bags ped to give the desired characteristics reinforced with nylon. The bags housed in metal containers attached the chassis frames. A diaphragm ming the bottom part of the bag is nected to a piston linked with the pension.

he American systems are basically

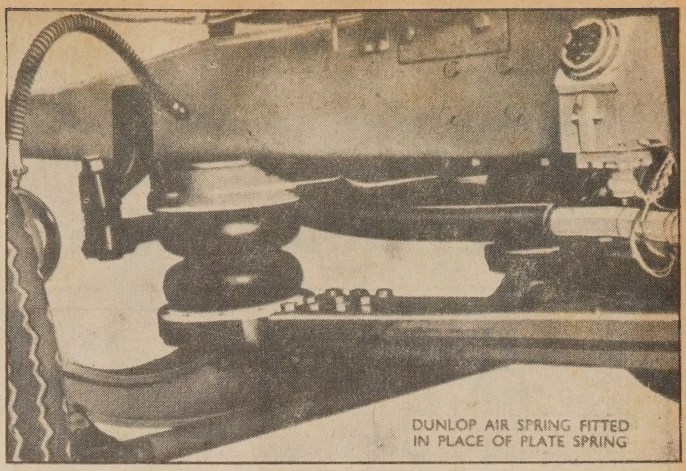


Illustration shows the new Dunlop air spring in place of the normal leaf spring.

the same as the British. Whilst various engineers hold different views on pneumatic springing, they all agree that:

1. It provides a long-needed variable rate spring which can be made high enough for stable motoring on rough roads and low enough for a pleasant ride on smooth roads.
2. Levelling of the car, despite load distribution, can be made quickly and easily. The levelling valves also eliminate pitch on rough roads.
3. The suspension can keep the car at a constant height, despite variations in loads and passengers. This means that the handling characteristics will remain substantially constant, adding to safety.

Despite the promising advantages of air suspension, the reactions of American buyers have been disappointing. Unquestionably one reason is the fact that all of their motoring is done on smooth-surfaced roads and consequently they remain unimpressed by the fact that the spring has a variable rate for rough roads.

Of more direct interest to Australia is the rubber suspension fitted to the Austin Gypsy, the new four-wheel drive "jeep" type vehicle to be marketed shortly here.

This uses the Spencer Moulton Flexitor trailing link system of suspension in which rubber in torsion acts as the springing medium. No routine maintenance is required. Each suspension unit has a tubular shaft with a flanged end on which the trailing link is mounted. An outer casing is mounted transversely in the chassis frame and the space between is filled by a rubber bush which provides the springing.

ANTI-SKID BRAKE

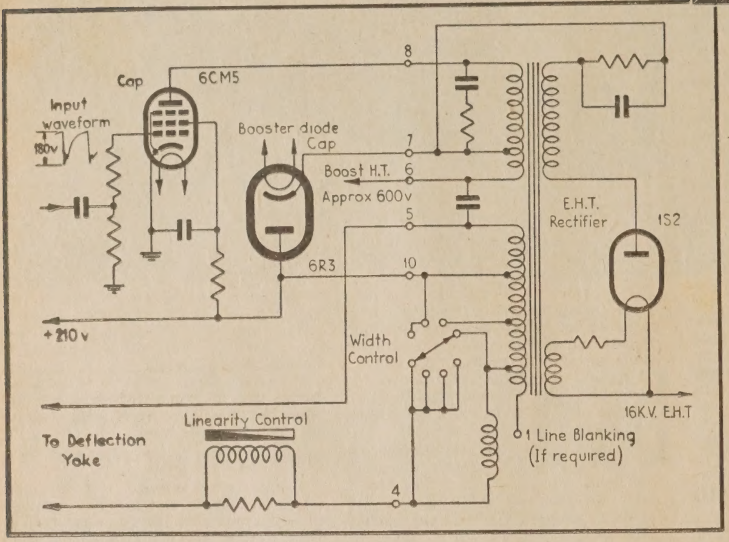
A new anti-skid brake recently introduced in Britain was another highlight of the automotive year. Designed by Dunlop, the unit is intended to permit maximum braking without any risk of the wheel locking and putting the car out of control.

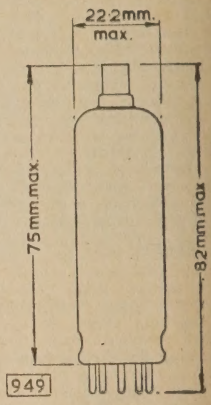
It is a direct descendant of the Maxaret device, introduced in 1952 for aircraft braking. Driven by each brake unit is a small flywheel contained in a housing together with a hydraulic valve. This valve remains closed in the event of normal braking, but when de-acceleration is particularly rapid—as when a wheel is about to lock—then the valve

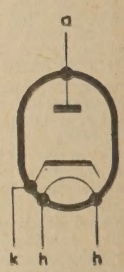
Will wheels become obsolete? Ford's Levapad principle may provide the answer.

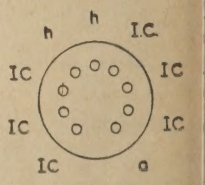
Mullard
TELEVISION VALVES

6R3
BOOSTER DIODE









B9A
Noval Base

6R3 CHARACTERISTICS

Heater Ratings	6.3V *at* 0.81A	

TYPICAL OPERATING CONDITIONS 90° DEFLECTION

Line Output Supply (Alternative Voltages)	200V	225V
Anode Volts Peak	4400V	4400V
Anode Current Peak	275mA	260mA
Anode Current DC	98mA	78mA

The 6R3 booster diode is mounted on a 9 pin miniature base with cathode top cap. It's high peak inverse voltage rating and cathode to heater insulation ensure a reasonable margin of safety in energy recovery circuits in television equipment. The valve ratings are more than sufficient to meet the demands of 90° deflection systems with an EHT of 18 KV. Additional data is available to design engineers on request.

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s, relieving the pressure on the hy-
lic system and so preventing the
e from locking.

ıe net effect is that the driver can
the brakes as powerfully as he
es on any type of road surface. Full
ure is maintained until the wheels
to lock. Then the braking effort
ised off automatically just enough
revent wheel lock. In this way, re-
ition on any type of road surface is
ble.

present, the system is still in the
rimental stages. Dunlops say that
ugh they have conducted their ex-
nents on disc brakes, it can be
ed equally well to drum brakes.

ıe valve may open several times a
ite under some conditions, and each
it does some hydraulic fluid escapes
the pressure is relieved. This fluid
en returned to the master cylinder.

OD BRAKE BUT . . .

s a safety decice, the new Dunlop
m is said to be the greatest technical
nce in braking since the introduc
of disc units in 1950.

it following the announcement by
of their Levapad principle, one
lers if possibly brakes as well as
ls are likely to become obsolete in
years to come.

rlier this year Ford built a model
some 3ft long, which they used suc
ully to demonstrate the new Leva
system of propulsion. The Levapads
the place of wheels and out of each
ges a small high-speed jet of com-
ed air. The car is thus supported
thin film of air. Propulsion units
provide the necessary power to
lerate or retard.

ıe Ford system has been hailed by
oit as being far more than a futuris-
reak. Ford's followed up the model
with a scooter that carried Press men
nd down a smooth corridor in per-
silence, without wheels.

ıey have also calculated that whereas
m.p.h. seems to be the maximum
ıl speed that wheels and tyres can
xpected to achieve (the rapid rate
ear makes faster speeds impractical),
Levapad has virtually no such limit.
more significant is the fact that
ılations show that a car supported on
equires far less power to propel it
150 m.p.h. than a conventional
led car. At lower speeds though
two systems just break even. This
incipally because it takes 50 b.h.p.
upport a car weighing one ton on
ıpads. After the initial lift, the
er required to propel the vehicle is
rstandably less.

L FOR FUTURE

ord's have effectively related dream
s with reality. They admit that in
immediate future, Levapads are more
y to be used in monorails for high-
d transport of goods.

ut, they are convinced, motorists of
y may easily live to see wheelless
, gliding over roads, fields and even
r.

England the giant Saunders Roe
raft Company are also experiment-
with a new "ship" which glides over
surface of the water, with an air
ion supporting it.

he year 1958 may easily go down
utomotive history as the year when
al springs were replaced with air and
idea of wheelless travel was born.

A "GHOST TARGET" IN THE SKY

The U.S. Army's new Kingfisher target missile can masquerade as any type of "enemy" aircraft or missile to test the effectiveness of defences.

THIS artist's impression shows the Kingfisher (above) and the "ghost" of an "enemy" aircraft which its electronic target device is projecting on to the radar receivers of interceptor forces.

The Kingfisher is also equipped with an electronic scoreboard, called a "firing error indicator," which automatically records hits by interceptor missiles. If the missile misses, its distance and the angle at which it passes the target are also recorded.

Thus the Kingfisher escapes damage itself and is recovered for repeated flights by a parachute in its tail and a nose spike on which it lands.

In the first real test of America's missile-age defences at White Sands (New Mexico) last month, the 3½-ton, 38ft long Kingfisher, developed by the Lockheed Aircraft Corporation's missiles division, was launched into the skies at several times the speed of sound, projecting the electronic image of an "enemy" missile.

An Army guided surface-to-air missile —the Talos—was then fired at the "attacker," which it quickly intercepted and "killed."

The Kingfisher is providing the U.S. Army with realistic conditions for defence tests and records valuable firing data to perfect the aim of newly developed missiles.

TV CAMERA IS TRANSISTORISED

ANOTHER step toward improved home reception of television programs was disclosed recently by the General Electric Company's Technical Products Department with announcement of the first monochrome or black-and-white TV studio camera incorporating transistors to replace vacuum tubes.

As a result, many high-pitched voice or sound waves sometimes, seen as wavy lines on home TV screens will be eliminated. The wavy lines, known as microphonics, are caused by vibrations in electronic tubes.

By using transistors to replace tubes in the video preamplifier portion of the camera, G-E broadcast engineers have eliminated a primary cause of annoying microphonics. Seven tubes have been replaced by transistors.

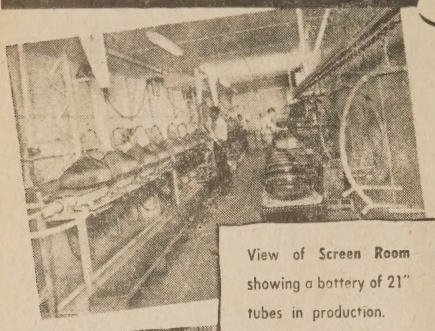
The camera was especially designed for ease of operation. In addition to transistors, the camera incorporates a 7in viewfinder to replace the 5in viewfinder formerly used. A dual-controlled, all-electric alignment system assures that once the camera is aligned, it is almost impossible to knock it out of alignment.

Transistors used in both the colour and the monochrome cameras represent the latest development in the transistor field. The devices, known as tetrode transistors, were developed by the company's Semiconductor Department. They are extremely reliable.

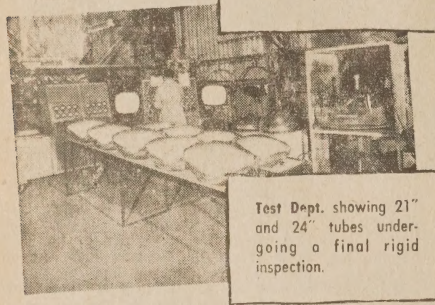
Use of the new transistors will result in greater reliability of operation, with less maintenance.

Use of transistors and other semiconductor devices in new or modified broadcast equipment is part of the department's overall objective of design innovation and simplification of ponderous and complex equipment. As a result all broadcast equipment is becoming smaller in size, is more reliable and less complex.

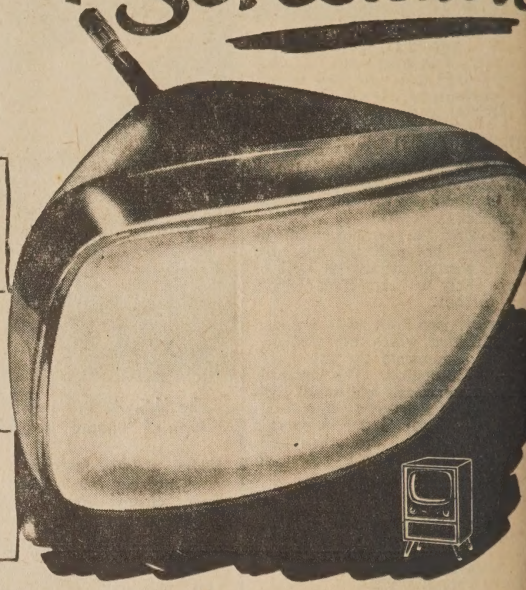
Your Eyes — will make you Screen wise



View of Screen Room showing a battery of 21" tubes in production.



Test Dept. showing 21" and 24" tubes undergoing a final rigid inspection.



'Thomas' Quality Control *makes the vital difference* in TV Picture Tube manufacture . . .

It's the kind of difference which can literally be **seen** on the **screen** and pays big dividends with long-lasting, true-to-life picture reproduction.

Whether you order five or five thousand Thomas Tubes, you are certain of only the highest-quality production control because every step in the making of a Thomas Picture Tube is the result of careful planning, rigid supervision plus the vast engineering "know how" of our overseas associates who have manufactured over eight million tubes.

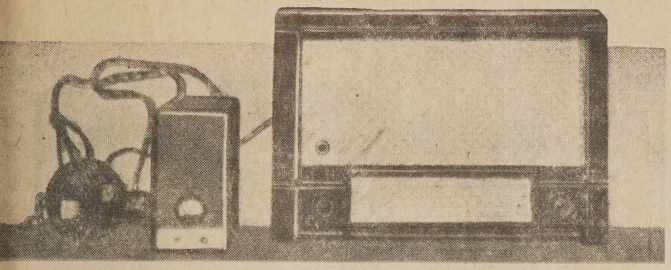
You'll have no difficulty in seeing a Thomas Picture Tube for yourself— **they're in all good sets—EVERYWHERE.**

Thomas PICTURE TV **Tubes**

Quality Products of Thomas Electronics of Australia Pty. Limited

THOMAS TUBES FOR TOP TV — *ALWAYS*

Russian Receiver Powered By Kerosene Lamp



Round jack and switch box for various power connections and the vibrator power supply with built-in voltmeter are shown to the left of Russian set.

An ingenious Russian built receiver has been produced for operation in the Middle East to receive broadcasts aimed at this part of the world. It uses one quart of fuel for each 8-16 hours.

THE Russian broadcast set shown above was built as a "poor man's adio" for the Middle East to enable the esidents of these countries to pick up Russian radio broadcasts.

The set is subsidised in that the buyer s given a partial refund on the purhase price so that the final cost amounts o about the equivalent of £20.

Even with the refund the price is retty steep for most of the would-be uyers. This, coupled with the fact that erosene is expensive and hard to come y in Middle East countries, has made cceptance of the set pretty limited.

The idea of using heat, such as from kerosene lamp, to generate a voltage run a set is novel but it is not new. everal European countries have tried nd discarded this method during World /ar II and before.

NGLISH IDEA

For example, the English had a somehat similar rig in the early thirties, sing flame from a gas jet rather than kerosene lamp, but the units were oublesome and impractical.

The thermocouple, mounted between e lamp's aluminium radiating fins, proices an output of 1.2 volts.

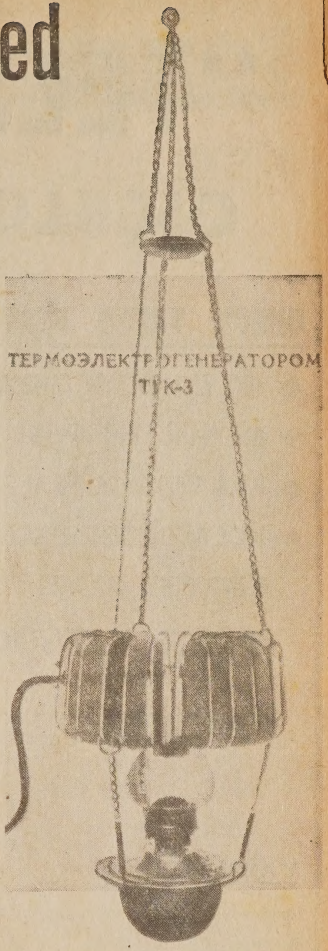
This is used for the filaments of the ibes and to drive a vibrator power supy. The output of the vibrator supply 90 volts for tube plates and screens. he radio will continue to play even ough lowered heat reduces the thermouple voltage to about 0.8 volt.

The radio itself is a 7-tube, 4-band perhet. It covers a frequency range om 175 Kc to 12.3 Mc. Two concenic-type controls on the right are for ndswitching and tuning, while two her concentric-type controls on the ft are for tone and volume.

The pilot lamp is at the lower left corner of the grille. When batteries are available, these can be used to power the set directly. The thermocouple and external power supply would then not be needed.

A heavy 5in speaker is used, and this, coupled with the push-pull output stage, produces fairly good output. Provision is made for an external speaker and phono pickup. Trimmer adjustment holes in the shield cans are covered with discs of red gummed paper to prevent tampering.

The chassis is made of heavy gauge aluminium, bent into U or channel-shape with mounting straps riveted to the corners. The cabinet is made of solid eucalyptus, or blue gum, with a beautiful hand-rubbed finish; however, from the inside it looks as if it had been chopped out with a dull hatchet.— "Radio and TV News."

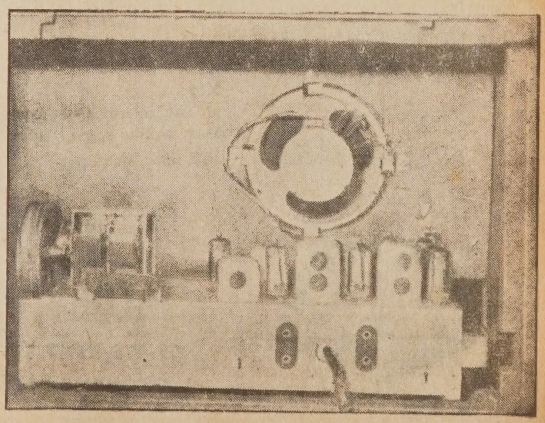


The "Thermo-electro Generator TGK-3" not only supplies heat and light but may also be used to cook some borsch in a pan placed atop the radiating fins. The wire lead from the built-in thermocouple is shown

☆

Rear view shows set to be a conventional design. Speaker is a 5" unit with heavy magnet. Miniature glass tubes are used. Beside the power cable are pin jacks for an external speaker and phono input

☆



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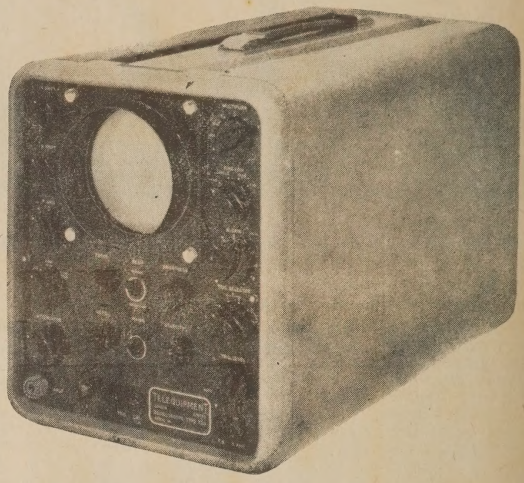

SPECIFICATION

Y AMPLIFIER

Sensitivity:—25mV per division.

Risetime:—0.06 u second.

Bandwidth:—HF response less than —3db at 6 Mc/s with no overshoot or ringing LF response. A 50c/s square-wave has less than 3% tilt.

Input Impedance:—2Meg shunted by 20 uu F.

Gain Control:—Continuously variable.

Expansion:— X1
X10
or any intermediate expansion
Max. writing speed,.1 uSec/div.

Time Standard:— 100 uSec sinewave.

Y ATTENUATOR

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Frequency compensated.
Voltage calibration:—
A 50 c/s squarewave 1V peak to peak ± 2% is provided.
Overall voltage measurement accuracy ± 5%.

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Internal or external

CRT:—Emitron 4EP1.

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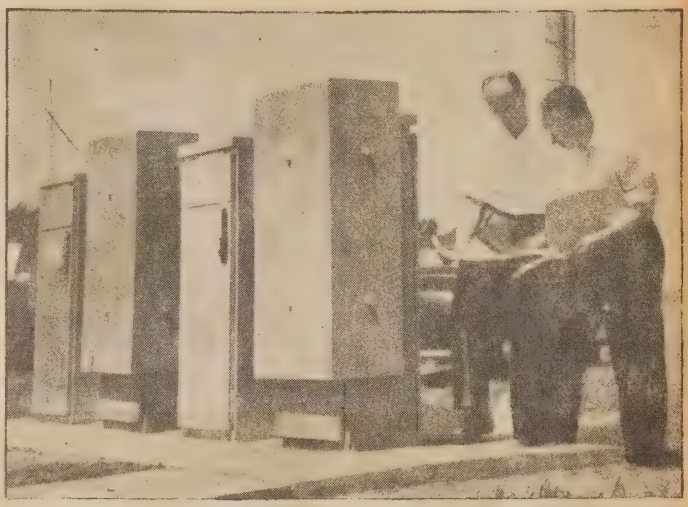
BBC TRANSLATOR EXTENDS RANGE

OW-POWERED RELAY SERVICE OR BAD LOCATIONS

The B.B.C. began transmitting programs on July 14, 1958, from a new type of lower-power television transmitter, known as a "translator," which is undergoing extended service trials at Folkestone. This town is typical of small populated areas which are within or adjacent to the service areas of the main B.B.C. stations, but are prevented by surrounding hills from obtaining satisfactory reception.



Weatherproof cases house the equipment which is unattended. The foot of the aerial mast can also be seen.

TRANSLATOR converts the sound and vision transmission frequencies from one channel to another without demodulation to audio and video frequencies, which occurs when a normal receiver and transmitter relay installation is employed. This simplification increases the reliability of the equipment which can therefore be arranged for automatic operation without attendant staff. Because the equipment is small it can conveniently be housed in weather-proof and insect-proof cabinets, thus dispensing with the need for a station building. The B.B.C. utilises cabinets of existing design and special precautions have been taken to provide sufficient cooling.

The translator must be on high ground where good reception is possible from an existing station in the B.B.C. network and from where its transmissions can be radiated over line-of-sight paths to the area to be served. In this way only a very low-power output is required, which therefore does not add to the already serious co-channel interference problem.

FOLKESTONE TRANSLATOR

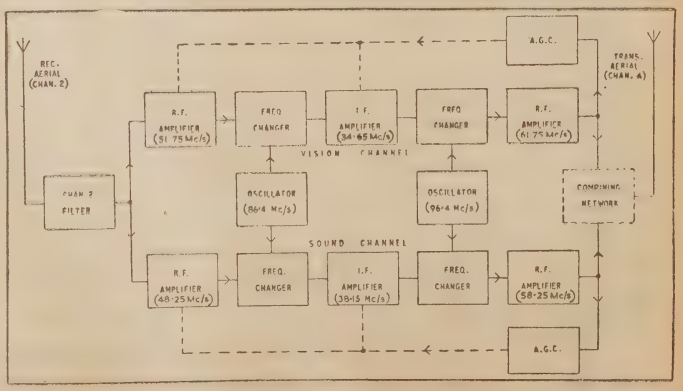
The photograph shows the Folkestone translator at Creteway Down where the receiving aerial is in line-of sight from the Dover B.B.C. television station and the transmitting aerial has a commanding position overlooking Folkestone. The receiving aerial system consists of a double 3-element array and the transmitting aerial has four tiers of single, folded dipoles.

If the sound and vision signals of a television system are amplitude modulated, difficulties are introduced if they share a common amplifier in the transmitter because of the greater possibility of intermodulation. These difficulties are avoided in the systems such as those used in the Continent in which the sound signal is frequently modulated. It is hoped that these and other difficulties have now been overcome with the system developed by the B.B.C. The diagram shows a simplified schematic diagram from which it will be seen that in this equipment, separate channels have been provided for the amplification of the sound and vision signals using common frequency-changing oscillators. The separate channel arrangement reduces the risk of intermodulation and enables separate automatic gain control to be employed to combat the effect of differential fading between the sound and vision signals, which could occur if a translator were dependent upon reception from a really remote B.B.C. station. The automatic gain control voltages are also used to initiate an automatic changeover to reserve translator equipment should the normal unit become faulty.

The double frequency-changing process facilitates the rejection of spurious signals and provides additional protection against 'inband' feedback. The first frequency-changing process resembles that in a normal television receiver, producing vision and sound intermediate frequencies of 34.65 Mc/s and 38.15 Mc/s respectively, and the second frequency-changing stage produces vision and sound signal frequencies in the required channel.

The Folkestone translator peak white vision power output is 1.5 watts and in conjunction with the type of transmitting aerial used gives an effective radiated power of 7 watts in the direction of maximum radiation. It is hoped that the installation of similar low-power translators which have been developed by the B.B.C.'s Designs Department will enable at least some of the small populated areas in which satisfactory reception is difficult to be given an improved television service.

The B.B.C. intends also to develop translators to extend the B.B.C.'s VHF Sound Broadcasting Service.



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SCOPE LABORATORIES MELBOURNE

AUSTRALIA'S HUGE RADIOSCOPE

PLANNED TO COST £500,000

A new radio telescope, the second largest in the world, is to be constructed for use by the C.S.I.R.O. from 1961. It will help our scientists maintain their world reputation in the field of radio astronomy.

An artist's impression of the completed structure.

ASTRONOMY is among the oldest of the physical sciences. It gives man a knowledge of his place in the Universe and the role played by our own earth in the larger universe beyond. For many centuries the study of astronomy was conducted entirely by observing the light emitted from distant objects. But 15 years ago, it was found that radio waves were reaching the earth from outer space.

In the last 10 years this knowledge has been exploited to expose a vast and exciting new radio universe. Radio waves are emitted by many celestial bodies, ranging from the Sun to objects outside the range of the best optical telescopes. The information gleaned by this new science is sometimes complementary to that of optical astronomy. In other cases it provides entirely new information not previously suspected.

The discovery that radio waves are striking the earth from outer space was made in the United States in 1932. But the science of radio astronomy did not really begin until 1946, when it showed rapid development in Great Britain and in Australia. Today there are 60 radio observatories in 20 countries, but Australia and Britain are probably the most advanced.

EARLY WORK

Early Australian work was accomplished with simple equipment of relatively low cost, but the stage has now been reached when the next instrument-step is the construction of a giant radio telescope some 200ft to 250ft in diameter.

A great deal of background work in radio astronomy will still be carried out by relatively simple equipment, but the really exciting discoveries of the future will come only from large instruments of high collecting power and high resolution, i.e., radio counterparts having the same research potential as the giant optical telescopes at Mt. Wilson and Palomar.

Some years ago the Radiophysics Laboratory of C.S.I.R.O. proposed the construction of an instrument 200ft to 250ft in diameter, costing in the neighbourhood of £A500,000. The proposal received immediate support in Australia and overseas. It was endorsed by bodies such as the International Astronomical Union and the Royal Astronomical Society, and was given grants of 250,000 dollars toward its cost from the Carnegie Corporation and the Rockefeller Foundation.

Additional sums have been received from a number of benefactors in Australia which are being matched pound for pound by the Commonwealth Government. The total sum available at present amounts to more than £A500,000.

THE REFLECTOR

The instrument consists basically of a huge, steerable parabolic reflector, the most important physical requirements of which are that the surface must be good to an accuracy of plus or minus half an inch. The reflector itself must be capable of being steered in any direction in the sky with an accuracy of plus or minus one minute of arc, that is, a thirtieth of the diameter of the full moon.

In 1955, a very stringent specification was drawn up laying out the exact requirements in detail. A highly competent group of engineers was then engaged to make a detailed analysis of the structural and control problems involved.

This design study was commenced in January 1956, and completed in December 1957, after which it was reviewed in Australia by officers of the C.S.I.R.O., by Professor Roderick, Professor Wittrick and Dr Messerle of the University of Sydney and by Mr A. Wills of the Australian Department of Supply.

In February 1958, it was decided to proceed with the design.

The general form of the device is shown in the accompanying illustration. It consists of a central tower on top of which the turning and control gear is located. Above this is mounted the parabolic reflecting surface which makes up the antenna proper. The diameter of the instrument will be 210ft, the size which estimates say can be built for £A500,000. It is smaller than the only other giant radio telescope in existence, the 250ft instrument at Jodrell Bank, near Manchester in England; but the surface accuracy will be approximately five times better and the pointing accuracy five to 10 times better.

Detailed constructional drawings of the instrument are expected within a few months, and it is anticipated that the supporting tower and the parabolic structure can be made in Australia with local materials. The drive and control system will come from overseas contractors.

The foundations and supporting tower should be started before the end of 1958, and the whole instrument should become available for scientific research in 1961.

SELECTING THE SITE

The site for the giant radio telescope must be in a region of the lowest possible electrical noise, so that the very weak radiations from the sky can be picked up free of interference. This requirement is the radio counterpart of the need to place an optical telescope far away from city lights.

A careful survey of sites within 50 miles of Sydney revealed none which would meet the stringent low noise requirement.

It was, therefore, decided to go into the interior and the choice finally fell on an excellent site near Parkes in New South Wales about 200 miles west of Sydney.

An area of approximately 400 acres

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A must for Transistors

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There is a danger of damage when soldering to transistor leads, due to A.C. leakage currents. The use of a low-voltage transformer supply, with earthed secondary is therefore recommended. Take care also that too much heat is not applied to flying leads. The ORYX iron, and a heat-sink such as heavy pliers gripping the lead between the contact point and the transistor, will ensure protection.

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Model 6a 3/32" (Push-on)	6	6	0.25 oz.	6"	As for Model 6 (for extremely delicate work only).
Model 5/32" (Push-on)	6, 12, 24-27½	8.3	0.25 oz.	6"	Hearing Aids, Radio and TV Sub-assemblies, Coils, Electronic Instruments, Model Construction, Electro-Medical, etc.
Model 12 3/16" (Push-on)	6, 12, 24-27½	12	0.5 oz.	6.25"	Radio, Television, and Telecommunications assemblies.
Model 18 3/16" (Push-on)	6	18	0.75 oz.	7¼"	For heavier work, heat capacity equivalent to that of most 80 watt soldering irons.

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is being purchased on the floor of a valley about 10 miles north of the township.

It is in attractive park lands surrounded by low foothills and eminently suited to a wide variety of activities in radio astronomy. The noise level is exceptionally low and it is hoped to protect the area from possible encroachment by sources of electrical noise in the future. The whole project would be endangered if certain types of industry or radio transmitters were to set up anywhere within a few miles.

It now offers a noise level which is probably lower than in any of the more highly industrialised regions of the world.

USE OF THE TELESCOPE

Australia has been one of the pioneers in the science of radio astronomy and made some of the most important advances in this new science. This new radio telescope will help Australian radio astronomers to remain in the forefront in this particular field. In a wider sphere, this development, in common with other present-day projects of a similar magnitude, will encourage the further progress of Australian science and help to retain our best scientific brains in the country.

Southern Hemisphere observers have the best opportunities in several important parts of astronomy. The central parts of the Milky Way can only be seen well from the south, and the Magellanic Clouds, the nearest neighbours of our Milky Way Galaxy, cannot be seen at all from northern observatories. The new radio telescope will contribute greatly to our knowledge of the universe around us.

The project is being carried out by the Radiophysics Laboratory, but it is in effect a national project. The optical astronomers at Mount Stromlo already work in close co-operation with the radio astronomers, and the facilities of the giant radio telescope will be available to any astronomer, Australian or overseas, who has a special problem which can only be solved with the aid of the new instrument.

MECHANICAL HANDS ARE GENTLE

The accuracy with which slave manipulators operate is graphically illustrated by this picture of one made by Pye operating a portable record player at the British Radio Show at Earl's Court last month. The manipulator has the addition of lateral displacement motion, permitting plus or minus 30 degrees displacement of the slave arm in relation to the master. It weighs about 450 lbs, and handles radioactive material weighing between 5 and 15lbs, and in certain positions over 30 lbs.

RADIO TRAFFIC CONTROL

A PROPOSAL to unsnarl New York's permanent traffic jam by radio-controlled intersection signals has been put forward by the city's Traffic Commission.

Commissioner T. T. Wiley will ask the city to spend 109,000 dollars (about £48,000) for the first phase of the program — a six-mile section of suburban roadway in the borough of Queens.

Under the new signal system, a radio receiver will be installed on the pole containing the signal equipment for each intersection. The receivers will be tuned to an FM transmitter that will control the entire 6-mile section.

The traffic department headquarters in the heart of New York will be connected by leased telephone wire. The timing of traffic cycles will be controlled from headquarters by a punched-card system that sends out one of 18 "programs" or light-change patterns to the transmitter for relay to each intersection signal.

"The radio control system," the commissioner said, "will permit broader application of progressive (staggered) signal timing and greater flexibility of operation by enabling signals to be changed from a central location without sending personnel out to the site.

"It will also permit us to expedite rush-hour traffic by favouring inbound cars in the morning and outbound traffic in the evening."

Besides adjusting light cycles to meet traffic conditions, the radio controls will be less expensive and require less tearing up of streets than the present system. Traffic control cable, installed, costs about 50,000 dollars a mile. The cost of radio controls is 15,000 dollars a mile, the commissioner said.

The initial installation is planned for 50 intersections with signals but a master station in Traffic Headquarters, costing 20,000 dollars, is proposed for control of all the lights throughout the city's five boroughs.

Separate transmitters for each of the four other boroughs will be needed when the program is expanded. The project is expected to be completed about the middle of next year. It will operate on frequency modulation channels assigned to the traffic department by the Federal Communications Commission.

The atomic explosions at Maralinga are evidence enough that Australia cannot remain aloof from the world problem of fall-out. Currently low counts in the southern hemisphere may only represent a temporary condition.

Why Scientists Want To Call Halt

The ever increasing concern of the top scientists and political leaders of the world regarding radiation from nuclear tests makes the matter of unusual interest to the public.

by Calvin Walters

AS a matter of fact when the top political leaders of the world begin to worry less about who has the biggest and best bomb and show some concern for the health of the human race, that will really be an event which makes history.

No doubt I stick my neck out when I say that, but that is how I feel.

We hear and read a lot about radioactive "fall-out" from nuclear tests, and the matter is at this stage so confusing that it has not been possible from newspaper accounts for the laymen to gain any concrete idea of the implications involved.

DEFINITELY HARMFUL

Scientists tell us that the radioactive debris which is released from a nuclear bomb explosion is harmful to the human race.

How harmful is something which they are still arguing about, but they all more or less agree that it is or will be harmful if the tests continue.

Some observers set out to show that only a small percentage of the population of the world is affected. But when all is said and done a small percentage of the world's population is a large number of people, and scientists are agreed that from a long-range point of view there is a possibility that most if not all of the world's people will be harmed if tests are not stopped.

If there is no nuclear war in the foreseeable future the continued testing of bombs at the present rate by all nations interested, with perhaps more to come, can easily lead to more bombs being exploded than would be exploded in an actual war. Thus the effects of "fall-out" would be spread over a much wider area than during an actual war where the thing could be over and done within a restricted area.

To gain some idea of what is worrying the world's scientists, it is necessary first of all to get a clear picture of what happens when radioactive particles get loose in the human body.

We hear a lot about Strontium 90 and so forth, but after all Strontium 90 is a comparatively new menace, being as it is a by-product of a nuclear explosio We will hear more about this anon.

Ever since man has inhabited th earth he has been subject to bombar ment by radiation from naturally occu ring radioactive sources such as th radium and uranium in the rocks the earth, cosmic ray particles, the radi active carbon which we consume in o food.

Added to this are the radiations ar ficially produced by man in the way X-ray machines, cyclotrons and so o Even television receiver screens emit small amount of radiation.

Fortunately for us all these radiatio added together have not been sufficie to have any appreciable effect on th human body except in those cases whe people have been over-exposed to X rays, nuclear reactors and so on.

CAN BE PASSED ON

Where the individuals concerned ha had no offspring after exposure, th effects are confined to them alone. B where there are offspring then the dan age may be transmitted to them and their children, and so on.

This effect is of the utmost impo tance to scientists and is the major pro lem confronting them today. It is n the present generation so much as futu generations which will be affected the long run.

Now what is radiation?

To simplify the matter somewhat y can take it that the radiation which giv us concern is the high energy radiati which is emitted by radioactive su stances.

It is a stream of particles travelli at very high speeds and which carry vast amount of energy within them.

There are all sorts of particles. Sor are electrically charged such as proto and electrons. Some are not charge such as neutrons. Then there are t photons which are electromagnetic pa ticles travelling at the speed of lig which is 186,000 miles per second. The are emitted by X-rays, which have mu greater penetrating power than light ra

The other particles mentioned do n necessarily travel at the speed of lig but nevertheless they really do move.

All particles are extremely small. T heaviest of them weighing only se million million billionths of a gram.

Now it can be imagined that such small particle, provided with high ener and travelling at such enormous spe would act somewhat like a bullet fr a gun in its ability to penetrate hum tissue.

When the particles penetrate ma the energy from them is absorbed the matter which receives them and latter either becomes heated or und goes a chemical change.

CONSTANT RECORD OF RADIATION

As is well-known all atoms have ne or more electrons revolving round ie nucleus in defined orbits like the lanets around the sun.

When the radiation particles enter the ssues or other matter it is usually one f the outer orbital electrons which is it and, if sufficient energy is exchanged etween the particle and the electron, ie latter leaves the atom and the atom ecomes electrically charged or ionised. he departing electron then becomes a ource of "secondary" radiation of lower ergy and will continue to interact with ther atoms until it finally loses its ergy and is brought to rest.

EXCITED" ATOMS

If, on the other hand, sufficient energy not transferred from the invading rticle to the colliding electron to cause e latter to leave the atom, the energy hich was transferred stays in the atom hich is then said to be excited. The ergy will then be either emitted again electromagnetic radiation or cause a emical change to take place within e atom.

It will thus be seen that any high ergy radiation particle entering any nd of matter will cause quite a com otion. In fact, it leaves a trail of de station evidenced by disrupted, ionised excited atoms and molecules.

Having now gained a general idea of diation, we will now take a look at the man body.

There are some hundred million mil- n cells in the make-up of an adult dy. Each cell is provided with a cleus and this in turn contains thread le substance called chromosomes.

Inside the chromosomes which incr ntally are arranged in pairs, there are dies called genes. Nobody seems to low what a gene consists of, but it has thing to do with Aladdin and his mp.

All we know is that it is the gene hich determines some peculiar heredi ry characteristic of the living body, be human or animal.

ORMALLY STABLE

Now this gene is a very stable unit use unit for want of a better term is usually transmitted from the parent the offspring together with its heredi ty characteristics, generation after gen- ation unchanged. It determines whether ou are a blonde or brunette, black nned or white, or whether you will bald like your dad.

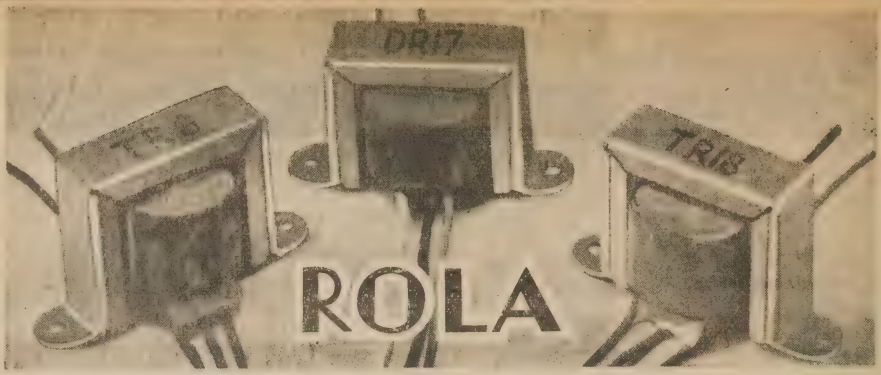
Very rarely a gene changes. This is lled a mutation. When it changes it comes as stable as the original gene at is transmitted from generation to neration in this form. It can then ange again either to a third kind or ck to the original.

Now a mutating gene is not a good ing. It is not so bad when a person herits only one mutant gene but when he inherits two (one from the mother nd one from the father), it becomes a ous matter.

It has been established that ALL muta- ons are harmful. Even minor ones are n harmful if not more so in the long n because the individual lives longer nd therefore passes the mutation to ore generations while the owner of a vere mutation will most probably die uickly and therefore the mutant gene ets out of circulation more quickly.

Australian Minister for Defence, Mr R. J. Heffron and Major-General Ivan Dougherty, Director of Civil Defence, examine a new instrument for recording radiation.

Meat from English and New Zealand herds alike shows very low radiation, despite reports to the contrary. But will it remain this way?



TRANSISTOR TRANSFORMERS

Suitable for use in the "Radio, Television and Hobbies"

"TRANSPORTA"

These transformers have been designed in the Rola Laboratories specially to meet the requirements of Australian radio set manufacturers for highly efficient driver and output units which provide a good frequency response when used with standard type low-powered transistors.

They are intended to operate into a standard 3.5 ohm impedance loudspeaker voice coil. In addition to Types DR17 and TR18 which have been designed for the transistor portable described in this issue. Rola also makes other types of transistor transformers. Specifications of some of these are listed below.

ROLA TRANSISTOR TRANSFORMER SPECIFICATIONS

TYPE	DESCRIPTION	IMPEDANCE OHMS	OUTPUT POWER 6 v.	9 v.
DR17	Driver transformer	3,000 — 2,000 c.t.		
TR18	Output transformer	375 c.t. — 3.5	175 mW	300 mW
DR4	Driver transformer	3,000 — 1,300 c.t.	150 mW	250 mW
TR7	Output transformer	420 c.t. — 3.5		
TR8	Output transformer	300 c.t. — 3.5	200 mW	375 mW

HIGH EFFICIENCY LOUDSPEAKERS

Two small high-efficiency Rola loudspeakers have already been developed for use with transistor or conventional battery-operated receivers and amplifiers. Others are on the way. For this transistorised portable use a Rola Model 5F. For miniature transistor receivers we recommend the new Model 4C-05A fitted with an F44 diaphragm. This speaker measures only 4⅛" overall by 1¾" deep, is light in weight—only 6¾ oz. (without transformer), yet has an efficiency equal to that of the earlier Model 4F. Its low cost, small dimensions and light weight make it ideal for miniaturised battery or transistor receivers.

ROLA COMPANY (AUST.) PTY. LTD.

From the point of view of heredity it only the mutations which occur in e reproductive organs of the male and male which are of concern. Therefore y radioactive particle which enters the lls of these organs, thus causing dis ption and mutations prior to reproduc on, is likely to have a most harmful fect on future generations.

There seems to be general agreement nong genetic scientists that there is no se of radiation too low to cause muta ons of the genes. That is why con derable emphasis is now being placed the wisdom or otherwise of X-ray servation of pregnant women.

ONG TERM EFFECTS

Controlled radiation is one thing. Un ntrolled radiation from exploding mbs is another and can have wide read harmful effects for thousands of ars. This argument goes something e the following as outlined by James Crow, professor of genetics at the iversity of Wisconsin: —

—"following an increase in the muta n rate, the resulting effects would be read thinly over many generations, hough the amount of harm would be ater in the first generation than in y other single generation, the first neration effect is none the less a very all fraction of the total. Geneticists ve estimated that about half the dam e would occur in 30 to 50 generations. id 30 generations is about 1,000 years.'

The effects of mutations include ooked legs, misshapen bodies and de mities of all descriptions.

In addition to the hereditary hazards ntioned above, excessive exposure to diation has other hazards. These are t pathological changes which can occur i various parts of the body.

Most of the products of a nuclear olosion are very short lived but there ione product which has a long life.

This is Strontium 90 which has a half l of 28 years and is the substance vich presents the greatest problem at t present time.

About 4 per cent of the uranium or tonium exploded becomes Strontium 0 which, being soluble, is rapidly ab sbed in the biosphere.

Originating as it does from a gaseous oduct it is rapidly spread over large a as.

IKE CALCIUM

Strontium 90 is chemically very simi l to calcium and is, therefore, easily sorbed by the bones of the animal tly.

Having a half life of some 28 years ican be readily seen what damaging ects are likely to accrue from the resi due in the bones of this particularly digerous product.

t has been shown that Strontium 90 tivels almost exclusively to the bones al experiments on animals show that it can kill the bones or cause serious c nges and can even cause bone can c. All of the information accumulated u to the present time has been derived fm experiments with Strontium 90 on a mals, as it is obviously not very pos sible to conduct experiments on human beings. The experiments have also been conducted with large doses, but as Stron tium 90 has such a long life, the prob ability of the same results occurring in m because of repeated and cumulative small doses over a period must be considered as being highly probable.

The effects of radiation appear to be brought about by the prevention of the division of the cells which is necessary for growth. Even in the adult, multiplication of cells is always taking place in order to replace those worn out or damaged.

It is the young growing individual that is thought to be most susceptible to the effects of Strontium 90. Fears have been expressed that the destruction of bone marrow, which has the important function of manufacturing blood cells, has as one of its causes the absorption of Strontium 90. This disease is called leukemia, and the incidence of the disease has been increasing. Likewise, a theory has been put forward that certain types of bone cancer could be caused by the "excited" atoms in the body mentioned earlier in this article.

ABSORBED BY PLANTS

As Strontium 90 is so similar to calcium, serious study is being devoted to the effects brought about by the absorption of the substance by plants. It is known that plants will absorb it from the soil and will also take it into their systems through the leaves.

The cycle then commences of the plants being eaten by animals. Cows absorb it and pass it into their milk. We eat the flesh of animals and the vegetables and the cycle goes on and on.

No finality has been reached regarding the effects of this cycle, but it is one which is being given the most serious consideration.

It seems to be generally agreed that at the present time the hazards from radio-active fall-out are "not as serious to mankind compared to other everyday dangers," as W. F. Neuman puts it, "the question concerns the future if tests are continued."

This future aspect is clear when considering the types of "fall-out" from an atomic explosion.

TYPES OF FALL OUT

Generally speaking, there are three types of radio-active fall-out. There is firstly the local fall-out. This is not very great if the explosion does not touch the ground. In the event of this happening, matter is drawn up into the fireball, becomes radio-active and is deposited in the form of fairly large particles. This type of fall-out can be as much as 80 per cent of the total debris.

The second type is the tropospheric fall-out from the lower parts of the atmosphere. It is finely divided material, which is too light to be affected by the force of gravity. It, therefore, hangs in the lower atmosphere for two or three weeks mostly in the region of the testing site, and is finally deposited by rain or snow.

The third type is the stratospheric fall-out. This is a finely divided material, which is carried up into the upper atmosphere, where its distribution becomes world wide. It has been estimated that this fall-out can stay in the upper at-

(Continued on Page 27)

"BLOODHOUND" DEFENDS BRITAIN

Selected by the RAF for the defence of Britain, the Bristol "Bloodhound" surface-to-air defence weapon uses booster rockets to speed initial launching. These are later discarded and propulsion taken over by internal ramjet engines.

MAGNETIC SOUND INDUSTRIES

Nothing But TAPE RECORDERS from £65 or £10 dep.

Five New-Releases

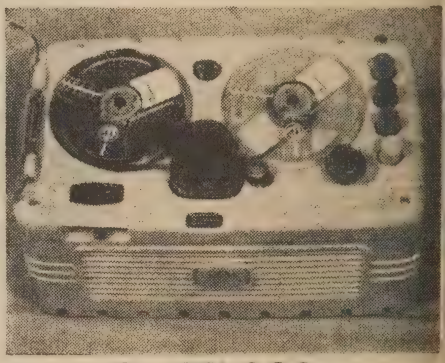
1. PHONO-TRIX

The new Phono-Trix is a masterpiece in miniature tape recorders. It's a self-contained power unit, which makes it ideal for work in the field. Ordinary 1.5 volt torch batteries which last for 50 hours power the Phono-Trix, giving a recording time of up to 75 minutes. Twin tracks, rapid rewind and fully automatic volume control on record, with automatic erasure during recording. Phono-Trix is in a smart pigskin carrying case, and measures only $10\frac{1}{2}$" x $5\frac{1}{2}$" x $3\frac{3}{4}$". Price is £79/10/-.

Trade enquiries invited. We are sole N.S.W. distributors.

2. WALTERS

This low priced English tape recorder is perfect for home entertainment. It weighs only 19 lbs. has $1\frac{1}{2}$ hours playing time. Frequency response 40-10,000 cycles. large inbuilt loudspeaker, single knob operation for added simplicity, smart 2-tone carrying case. Ideal for speech and music, only £79/10/-.



3. GELOSO

Latest Continental Tape Recorder from Italy. Weighs only 8 lbs., 2 speeds, press-button operated. Gives wonderful reproduction. Complete with tape, highgrade microphone and zip carrying bag, £89/10/-.

4. PHILIPS

Long-awaited new Philips model — top-quality recorder for only £94/15/

5. SAJA

Very newest release at Magnetic Sound Industries. Price, £136/10/

USED MACHINES FROM £65 Fully Guaranteed from £10 dep.

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Technical Review

RADAR CONTROLS AIRCRAFT TRAFFIC ON THE GROUND

TAXI SERVICE IS SAFE AND SPEEDY

At busy airports, traffic control on the ground can be quite a problem, particularly as objects and vehicles other than aircraft may be on the ground. This new use of radar for ground control marks an important contribution to speed and safety before and after aircraft are actually flying.

AIR CONTROLLERS at New York's busy International Airport are now using high-precision all-weather "taxi radar" to control aircraft and miscellaneous traffic on the ground.

The airport surface detection equipment (ASDE) installed recently atop the 101ft control tower at Idlewild presents a clear picture of the 5,000-acre grounds, showing fixed objects, ground vehicles, aircraft, even men and birds.

ASDE is a short-range K-band radar developed and manufactured by Airborne Instruments Laboratory. The Mineola, N.Y., firm, a division of Cutler-Hammer Inc., expects to sell the equipment to airport operators and the military for around 200,000 dollars.

VERY PRECISE

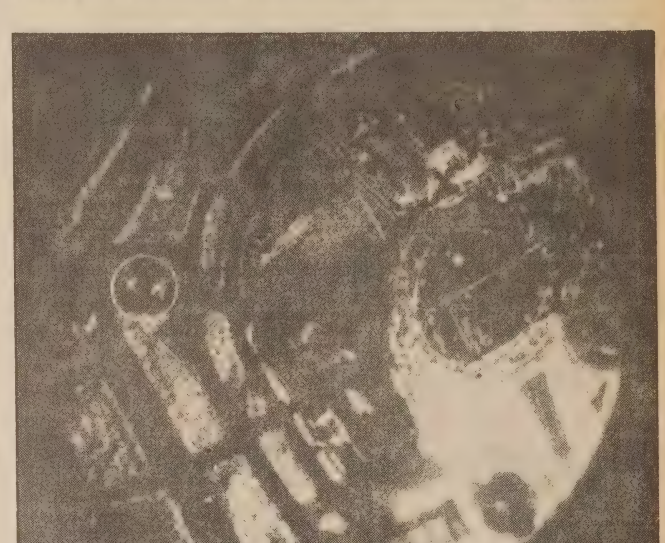
Angular and range discrimination of ASDE is precise enough to show controllers the shape of a plane half a mile away, even spotting the engines (picture). The system can resolve targets to 10ft in range, 0.25 deg. in azimuth. It achieves this precision by sending out short pulses on a narrow beam at a rapid repetition rate.

The transmitter produces 0.02-u sec. pulses at 50 Kw peak power and at a pulse rate of 14,400 pulses a second. The horn-fed double-curved reflector produces a beam 0.25 deg. wide and 1 deg. high at half-power points, rotates at 60 r.p.m. to provide continuous surveillance.

Bandwidth of receiver IFs is 100 Mc, with 50 Mc video stages. Ppi display uses a 16in aluminised flat-face tube which can resolve 1,000 lines. Maximum presentation range is three miles per radius (the set's maximum range is about four miles), although the presentation can be off-centred.

From the control room operator can select vertical or circular polarisation of the transmitted beam. Circular polarisation cancels much of the clutter due to rain, keeps ASDE on the air in all kinds of weather.

The ASDE system was installed at MacArthur Airport in Suffolk Co., N.Y., for evaluation. Controllers have been known to complain about its sharpsightedness. They've picked up crows flying over MacArthur a mile away. Once they sent a truck out to investigate a "dangerous object" which showed up on the scope, but was not visible through a ground haze to the tower. They found a man walking along the runway.



A typical presentation on the PPI screen. Despite the losses involved in photography and printing, the outlines of two aircraft are still clearly visible in the picture.

SHIPS NOW USING "ACTIVE RUDDER"

A SYSTEM originally developed in Germany and currently being put to use by British shipbuilding yards promises to increase markedly the manoeuvrability of ships required to berth or navigate in difficult waters. It is known as the "active rudder" system.

It is a well known fact that a conventional rudder is only effective when the ship is in motion and it becomes progressively less efficient as the ship loses way.

In the active rudder scheme, a blister containing a large electric motor is built into the moveable rudder and drives an auxiliary propeller set in a short tube cowling left with the aft edge.

When powered, the auxiliary motor and propeller push the stern of the ship in the direction in which the rudder is turned.

It has been found in practice that a vessel so equipped can be manoeuvred at a speed so slow that a normal rudder would be virtually useless.

In point of fact, the stern of a ship can be moved sideways with the prow stationary.

★ CRYSTAL MICROPHONES
★ MICROPHONE INSERTS

TABLE or STAND MICROPHONE, MIC22

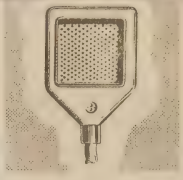
This omni-directional Microphone is robust in construction, with a pleasing appearance. Vibration, shock or low frequency wind noise will not affect the performance. An adaptor (floor mounting) is available at low extra cost.

PRICE £9/18/6.

CRYSTAL MICROPHONE, MIC40

The MIC40 has been pleasantly styled in a variety of two-tone colours to give a handsome quality Microphone of modest dimensions and unassuming price. Ideal for tape recorders with a minimum of stowage space available, and a wide range of domestic applications.

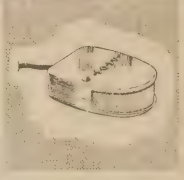
PRICE £3/19/6.



LAPEL MICROPHONE, MIC28

Designed to give freedom of movement, this Microphone is small and non-directional. Housed in a soft, moulded-rubber case which gives protection against shock, it is provided with a pin at the rear of the case for pinning to the lapel.

PRICE £5/19/6.



GENERAL PURPOSE, MIC35

The MIC35 is housed in an attractive die-cast case, it features a high sensitivity and substantially flat characteristics. Provided with a built-in shunt resistance of 2 megohms, it will, when connected to the grid of the input valve, give a substantially flat response from 50 to 5,000 c.p.s.

PRICE £2/15/0

HIGH-QUALITY MICROPHONE, MIC

Incorporates the worl famous floating crys sound cell constructio Its fine performance not affected by vib tion or shock, and t fidelity is not impair by low frequency noi

PRICE £24/19/6.

CRYSTAL STICK MICROPHONE, MIC39-1

The MIC39-1 has been beautifully styled as a hand, desk stand or floor stand unit, and precision engineered to the highest professional standards.

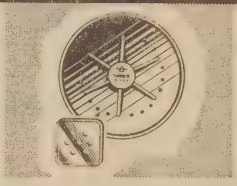
A heavy die-cast liner in the microphone case eliminates the possibility of hum pick-up due to hand capacity effects. The use of a special noise free cable improves screening and gives a greatly increased signal to noise ratio.

Designed especially for high quality recording, broadcasting and public address work. PRICE £8/19/6, complete with desk stand.

HAND or DESK MICROPHONE, MIC33

Has been designed for the public address and home recording field. High sensitivity and flat characteristics are obtained by a specially designed acoustic filter. Housed in an attractive plastic case. Unaffected by vibration, shock or low frequency wind noise. Omni-directional frequency response substantially flat from 30 to 7,000 c.p.s.

PRICE £6.16.6.



CRYSTAL MICROPHONE INSERTS

These inserts are available in varying sizes, ranging from as small as 15/16 in. square to 1 13/16 in. round, with various thicknesses from 7/12 in. to 9/16 in. Suitable for every purpose, such as hearing aids, public address, tape recordings, amateur transmitters, etc., they have responses from 2,250 c.p.s. to 3,500 c.p.s. at —5 db to —30 db. Insert can be supplied with or without 10 meg. resistor as required. MIC19/4 and MIC32, £2/15/6; all others £1/19/6

DESK or HAND MICROPHONE MIC36

Ideal for home recordir public address, etc. The p formance is not affected vibration, shock or low f quency wind noise. Omni- rectional frequency respor substantially flat from 30 7,000 c.p.s. Recommend load resistance not less thar megohm, dependent on frequency response. Can supplied complete with swi and floor stand adaptor, as quired, at a small extra c

PRICE £6.18.6.

Sole Australian Agents:

AMPLION (A'sia) PTY. LTD.

101 Pyrmont Bridge Rd., Camperdown

Sydney, N.S.W. Phone LA 6124.

Victorian Distributors: DISTRIBUTORS CORPORATION, 403 Bourke Street, Melbourne.

IS THERE A CASE FOR A 567 LINE PICTURE SYSTEM?

ALTERNATIVE TV STANDARD FOR GREAT BRITAIN

British engineers are still seeking a successor to their present 405-line TV system which seems hardly likely to be continued into any new system which may be used in the future. Here is a suggestion for a standard which has not been employed to date.

has long been apparent that the British television system suffers from undesirably low number of scanning es.

A change to 625 lines, with or without Mc bandwidth, &c, has been con- ered. Another alternative, giving an proved system with the minimum of anges in equipment, is discussed here.

It has been pointed out that with a Mc bandwidth and 405 lines there is excess of horizontal over vertical finition of from 50 to 100 per cent, hereas equal horizontal and vertical finition would be desirable. An in- ase in the number of scanning lines uld improve the overall picture de- fition and reduce the lininess of the ture. Furthermore, the increased e-scan frequency would greatly reduce t effect of "line whistle" from the line tput transformers and scanning coils c receivers.

For a given bandwidth, frame fre- ency and aspect ratio, the requirement f equal horizontal and vertical defini- n is given by:

$$kN^2 \frac{V}{H} = \text{constant}$$

vere k is the value taken for the Kell ctor, N is the number of lines, and V and H are the fractions of vertical al horizontal scanning times which are ually used in forming the picture.

he value of N used at present, i.e., 4 , gives equal horizontal and vertical finition assuming k=1. It is now sidered, however, that the Kell fac- t has a value much lower than unity, al that k=0.5 approximately for inter- ed scanning systems.

Other things (bandwidth, V/H, &c) ng equal, it is therefore necessary to ble the value of N squared in order to ain equality of horizontal and vertical finition, i.e. the optimum number of ls for the British system would be uare root of 2 times 405, or approxim- ely 570.

et us now consider practicable num- bs of lines. For convenience in line- frame frequency count-down circuits, its desirable that the number of lines sen should factorise as the product several small odd numbers. (Even- mber factors are not permissable, since th would make N an even number,

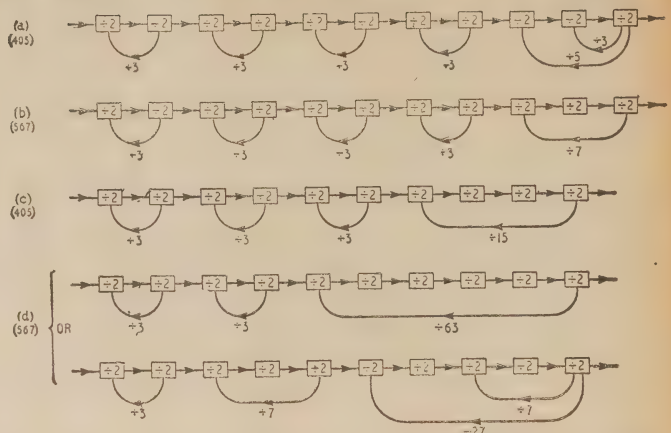


Fig. 1 Systems of multivibrators with feedback loops, indicating count-down ratios for 405 and 567 lines.

which cannot be used in an interlaced system.) If we compute all the numbers between 400 and 650 which have only odd factors less than ten, i.e., factors of 3, 5 and 7 only, we obtain the following limited selection:

$$405 = 3\times3\times3\times3\times5$$
$$441 = 3\times3\times7\times7$$
$$525 = 3\times5\times5\times7$$
$$567 = 3\times3\times3\times3\times7$$
$$625 = 5\times5\times5\times5$$

Among these magic numbers we recognise several old friends. There is also one interesting stranger, 567, which nicely fills our bill for "approximately 570."

Turning to the practical problems of a changeover to 567 lines, it is necessary to consider in our long-established television system the requirements in transmitting and test equipment, as well as those in existing and future receivers. It will be noticed immediately that for count-down circuits 567 is particularly well-placed as a successor to 405, requiring the alteration of only one count-down factor from 5 to 7.

Furthermore, in cases where a series of bi-stable binary counters is used, together with feedback loops for unity reductions in division ratios, the system can be changed from (a) to (b), or from (c) to (d) (see Fig. 1), requiring no change in the number of multivibrators in either case. Thus it is likely that much of the transmitting and test equipment used for signal generation on 405 lines could be economically converted to 567 lines.

As for receivers, sets giving satisfactory performance on either standard could be produced in anticipation of a change-over. The modification of existing 405-line receivers would be a more difficult task. However, a 40 per cent increase in line-scan frequency without disastrous effects on picture width or e.h.t. voltage could probably be obtained without major modifications in many cases. The line (and frame) flyback times of the new system could be made long enough to avoid embarrassment to the timebases of existing receivers. — Wireless World.

NON-SKID TYRES ON WET ROAD

A NEW approach to the problem of the motor car tyre skidding on a wet road was suggested by Dr. D. Tabor, of Cambridge University.

The tendency for a tyre to skid is due to the presence of a film of water, between the rubber tread and the road surface, which acts as a lubricant. The present design of tyres aims to produce a "squeegee" action, which squeezes the water out from the boundary and allows the rubber to grip. Dr. Tabor's suggestion is to make use of another property of rubber. Some rubbers are relatively non-resilient and a great deal of energy is consumed when they are deformed. Rubber compositions of this kind would not be suitable for tyres because much energy would be lost as the case deformed as the wheel turned.

But a non-resilient rubber used for a tyre tread would resist the passage of a stone chip on the road ploughing through it—in other words it would not skid easily on a roughish surface. This non-skid property is quite independent of ordinary friction and would be unaffected by a wet road. Tyres of the future, therefore, might be designed with a non-resilient tread and a highly resilient case.

BOOK REVIEW

1958 BROADCASTING AND TELEVISION YEAR BOOK edited by Leonard Blanket and published by Greater Publications Pty. Ltd., Sydney. Hard cover 277 pages (including advertising).

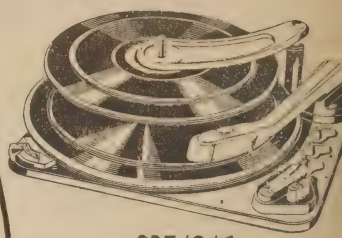
A collection of facts and statistics mainly of interest to radio and television program and advertising people. The Australian price is 37/6.

Dual

AUTOMATIC PRECISION-BUILT CHANGERS and PLAYERS

1005 – CHANGER

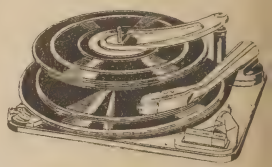
Fully Automatic with many superb features to guarantee faithful reproduction and reliability of operation. Automatic needle selection —built-in scratch filter—pause switch to control changing time cycle —roller glide selection of record size—onearm lock and many other carefully designed functions.
Fitted with the outstanding CDS3 cartridge and DN2 twin sapphire needle assembly.



£37/9/6

1004 – CHANGER

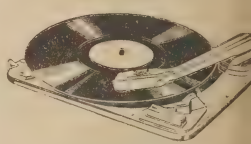
A simplified version of the above model without automatic needle selection, scratch filter or pause control. Operation is by three push button control incorporating start, stop and repeat functions. Needle selection is by trigger control situated in the pickup head. Fitted with CDS3 cartridge and DN2 needle assembly.



£32/8/6

1004 – T12 AUTO-PLAYER

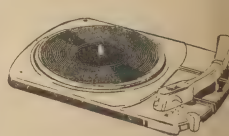
The latest addition to the DUAL range this model is the result of numerous demands for an automatic player retaining all the gentle operations and safety features of the changers without the actual dropping of records. All possibility of damage to records and styli is eliminated.



£28/10/-

295 PLAYER

Fitted with automatic cut-off this model is particularly suitable for building-in where space is limited or for use in portable units. Fitted with the CDS2B cartridge and DN2 Needle assembly the same high quality of the larger DUAL models is retained.



£18/10/-

SPECIAL STYLI to suit above units

DN24 (Diamond L.P. Sapphire Std.) £11/-/-
DN22 (Twin Micro Sapphires) £1/16/9
DN21 (Twin Std. Sapphires) £1/16/9

All models can be supplied fitted in leatherette carrying case

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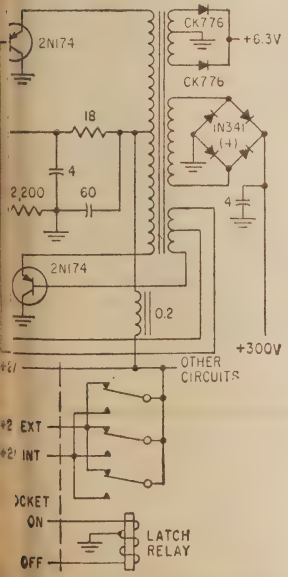
You'll need a PLATTER

TELEMETER TRANSMITTER FOR VANGUARD ROCKET

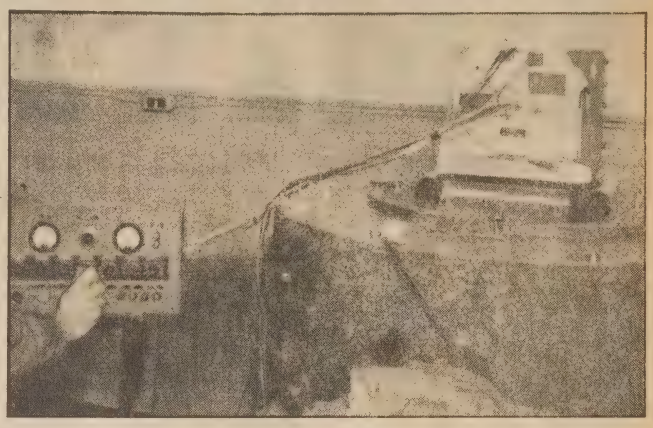
UIPMENT WHICH
NT PERFORMANCE
ATA BACK TO EARTH

he engine performance data of
ie Vanguard rocket are relayed
earth using this telemetering
ansmitter. Voltage variations
epresenting performance are
cked up with a commutator
id converted to pulse width
odulated signals by a keyer.
uration of pulse width shifts
e frequency of a crystal-con-
olled oscillator producing a
wm/f-m signal which is fre-
uency multiplied, amplified and
d to telemetering antenna.
wer supply is transistorised.

LIGHT performance data from the
anguard rocket are made available
ound control stations using the tele-
ring transmitter discussed here.
e telemetering transmitter consists
commutator, a keyer, a transmitter,
f power amplifier, a transistorised
r supply and a small coaxial blower.



ht 2—Power supply circuit. Input
che prevents power supply transients
rc entering 28-volt source in rocket.
Magnetic latch relay eliminates need
holding current and provides positive off-on action.



Telemetering transmitter undergoing vibration testing on shaker table. After testing, unit is installed in second stage of Vanguard rocket and used to supply performance data to engineers during static and preflight checks, as well as after launching.

All components are packaged in a cylindrical pressurised container.

Entire unit, including support structure and container, weighs 14 pounds and is 8 5/8in high by 9 1/16in in diameter. Before installation, the assembly must withstand a 10-g vibration for two minutes in each of three planes and a random vibration through a bandwidth of 2,000 cycles.

A schematic diagram of the data and voltage regulator circuits is shown in Fig 1. Rocket signal sources brought out to contacts on the commutator are scanned by motor-driven wiper arms. As the arms move across the first 43 contacts, information from 41 data and 2 calibration channels on signal switch S1 and trigger pulses generated by successive making and breaking of grounded contacts on time switch S2 are sent to the keyer.

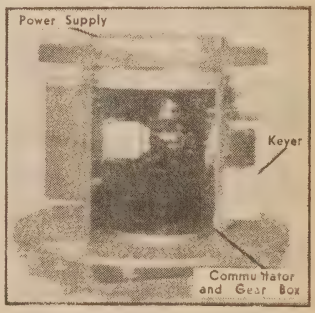
Since signal and time data are picked up on separate switches, each channel can be monitored at the exact moment of no brush bounce. This technique eliminates noisy make intervals.

SYNCH. SIGNALS

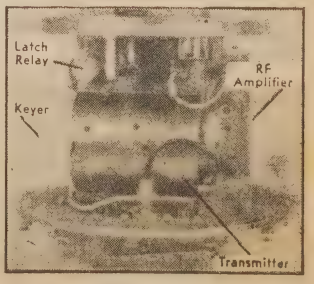
When the wiper passes over contacts 44 and 45, switch S1 is grounded and switch S2 is open circuited. During this period, time signals from the rocket-time row are fed to the keyer. These signals synchronise the transmitter with the ground station equipment.

The keyer triggering circuit converts the time signals into a series of delayed, sharp pulses which trigger the monostable multivibrator for each succeeding data channel. Result is an output signal made up of a series of synchronised square wave pulses proportional in width to the voltage from 43 data channels.

Pulse-width-modulated signals from the keyer are applied to a reactance switch in the transmitter. This switch modulates the crystal controlled oscillator, causing a shift in the quiescent frequency between 30 kc upper and lower limits for the duration of each pulse. The frequency shift is proportional in time to the voltage applied to



Commutator and power supply are mounted within U-shaped support structure. External connectors are located on bottom plate of unit.



Keyer, transmitter and r-f power amplifier plug into receptacles on sides of U-shaped aluminium support structure. All tuning controls are accessible.

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An important addition to the r — EMITAPE EMICASE. Besides an attractive, du means of packa EMITAPE in EMI offers a new appr to yo stor problems.

"88" GENERAL PURPOSE

"99" LONG PLAY 50% increased playing time

- ANTI-STATIC
- METALLIC CONTACT STRIPS FOR "AUTO STOP"
- PRE-STRETCHED P.V.C. BASE
- HIGH SENSITIVITY
- FREEDOM FROM CURL
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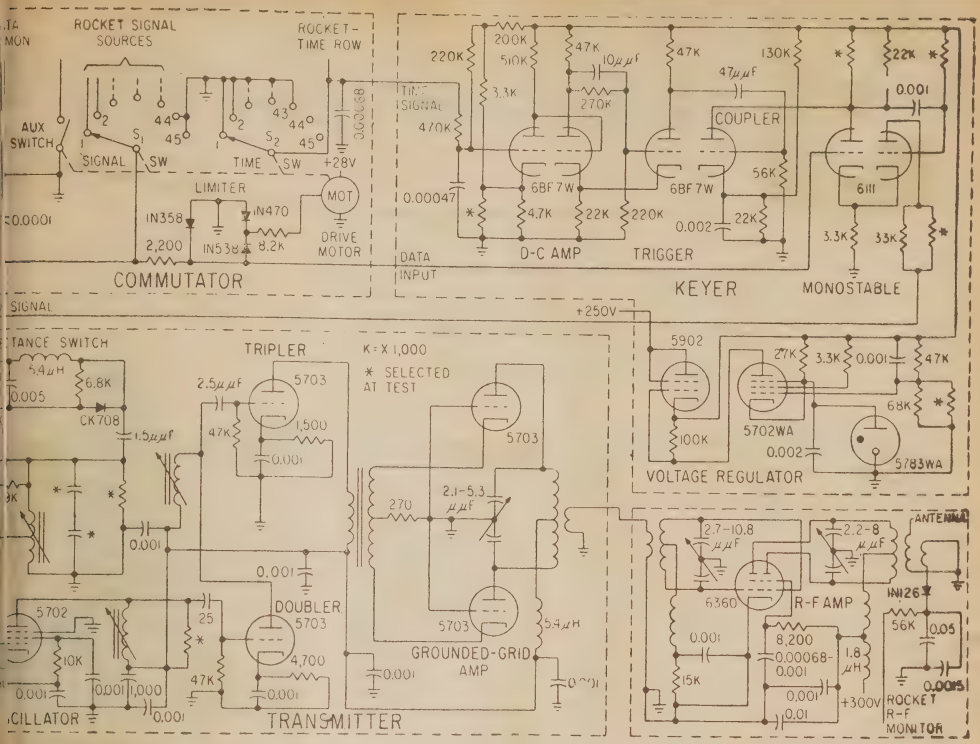

(1—Data and voltage regulator circuits. Commutator contacts are shown arced for simplicity. Wiper arms run at 1,200 rpm gh motor-driven gear reduction assembly. Transmitter operates in the 215 to 235-mc telemetering band and delivers 4 watts of r-f power into a 52-ohm resistive load. Limiter in commutator signal line prevents overloading of keyer.

ata channel. Output frequency of ystal-controlled oscillator is then d and tripled.

r-f power amplifier amplifies the and f-m carrier. A pickup loop nitoring purposes is included. The ler is capable of delivering an aver- wer output of fifteen watts. Plate ater voltages are provided by the e supply shown in Fig. 2.

—Electronics.

CENTISTS WANT TO CALL HALT

(Continued from page 19)

re for ten years before it finally into the troposphere and be de- by rain or snow.

h conclusions which have been by scientists from the scanty in- on available have thus led them ve that it is not so much today atters, but what will happen to man race in years to come if e tests are continued.

the known facts about the re- f mutations and the effects of m on the human system and how ctive exposure in overdosage can erious consequences to the indi- it can readily be assumed that ed exposure to small doses of a ng substance which can accumu- the system for 28 years must e he greatest concern to those re- sle for its production.

LIMIT TO COMPRESSION RATIO?

HOW much higher can auto engine compression ratios rise?

An answer to this question was offered to the Society of Automotive Engineers recently by D. F. Caris and E. Nelson of General Motors Engineering Staff, based on their experiments with seven V8 modified engines ranging from 9-to-1 up to 25-to-1 compression ratio.

They said present day engines would give the motorist miles per gallon dividends up to approximately 17-to-1 compression ratio, providing the petroleum industry could economically supply fuels for them. They found that an engine's thermal efficiency "peaked" at the 17-to-1 level.

Primary reason why ratios above that level are not feasible, at least with engines based on today's designs, is a delay of the combustion process in the engine combustion chamber.

The speakers said today's engine-and-fuel relationship is not unlike the situation in June, 1947, when C. F. Kettering announced an experimental 12-to-1 compression ratio engine.

At that time average engine compression ratios were about 6.5-to-1 and fuels were in the 85 octane range. Mr Kettering predicted that if higher fuels were available, increased compression ratios would result in economy and efficiency gains for the motorist.

Mr Caris and Mr Nelson pointed out that today's premium fuels are in the 100-octane range and compression ratios average approximately 9.5-to-1. This posed the question of how much higher ratios can be raised before miles-per-gallon economy, efficiency and engineering "fringe benefits" begin to taper off.

In their experiments Mr Caris and Mr Nelson used production type 324 cubic inch displacement engines with modified combustion chambers. Experimental fuels permitted operation at the higher compression ratios.

Meanwhile, the speakers said their test results didn't imply that 17-to-1 compression ratio was a fixed ceiling for future automotive engines, but by all indications this was a ceiling at present.

"This study has once again shown that substantial gains in thermal efficiency can be obtained by further increases in compression ratio," they told the SAE.

"Whether these gains can be realised as an overall economic gain to the customer will depend on the ability of the petroleum industry to continue economically to increase anti-knock quality of commercial gasoline.

"In the event that future advances in petroleum technology result in the economic production of higher octane fuels, the results of this investigation point the way to further improvements in the efficiency of the spark ignition engine."

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★ AN AUTOMATIC PLAYER
★ A MANUAL PLAYER

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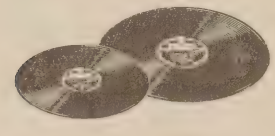

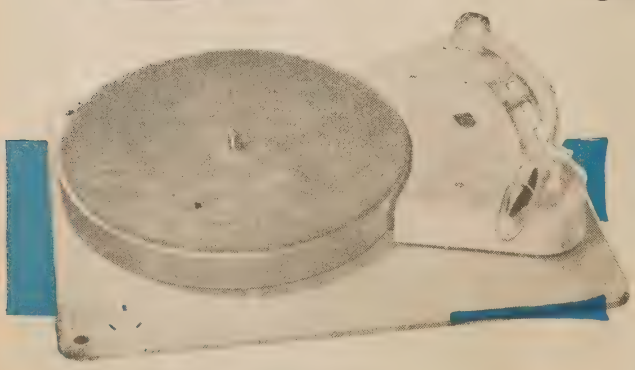

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NEWS AND VIEWS OF THE MONTH

isible earth belt

earth is hemmed in by a dense
nd powerful radio-active belt which
amper space travel, according to
sor S. F. Singer, of the University
aryland, who put his theory re-
to the International Astronautical
ence.

said the belt begins 250 miles up,
s as high as 40,000 miles, reach-
peak density at about 6,000 miles.
trons released by cosmic ray
rdment of gases in the earth's
here had built up the belt.

earth's magnetic force had trap-
at the edge of the atmosphere.

nanned satellite 12 feet in dia-
would need about five tons of
ive lead covering, he forecast.

rwise the crew could absorb a
e's maximum dose of radiation
e hours.

a counter measure, he proposed
through the belt satellites which
attract the particles and "sweep
e radioactivity.

ther American, Dr Bela Karlovitz,
sburg, told of a space ship he
signed which would be powered
dust.

ship could conceivably approach
eed of light—186,000 miles a
—to make trips to other stars.

He said it would draw its power from hydrogen gas out in space.

This was the "stardust"—hydrogen ejected by stars like the sun.

Soon comes smellies

A NEW YORK perfume company has fixed a date for release of the world's first film with scent effects.

The Weiss Screen Scent Corporation recently announced that the film would be shown on March 26.

It plans to waft scents suiting the moods of scenes into theatres through air-conditioning units.

A spokesman of the firm said: "We have to be very subtle.

"People might laugh or be bothered if the scents got out of hand.

"We will use, say, a jasmin scent to identify a beautiful heroine.

"When she's due to appear, or be thought about, her jasmin scent will float in."

The spokesman said an electronic apparatus attached to the film projector would set off scent sprays.

The first of the "scenties" would have no definite plot, but plenty of scent. He did not say what the state of the atmosphere would be at the end of the show, or how the various scents would be cancelled after use.

TV for India

INDIA will install a pilot television station in October to beam educational programs to villages round Delhi.

After months of research on closed circuits lent to India by foreign countries which exhibited at the 1955-56 Industries Fair here, the All-India radio will be ready to start television to a limited number of villages by early next year.

The pilot station will be installed in Delhi and will be received in the villages on community sets.

Widespread individual reception of television is not expected for many years yet, as the cost of television sets is far beyond the reach of the average Indian's pocket.

Fast trip

A VISCOUNT airliner recently set an Australian passenger plane record in a flight from Mt. Isa to Brisbane.

The plane — flying at an altitude of five miles—used a 162-mile-an-hour tail-wind to reach a top speed of 482 miles an hour.

It brought 27 passengers into Brisbane one and a half hours ahead of schedule.

The Viscount's normal speed is 320 miles an hour.

POPULAR SCIENCE QUIZ

Q: A reader from Condoboin, N.S.W., asks whether there is any foundation for the claim that a stronger twist can be obtained with a screwdriver having a long handle, than with a short-handled type.

A: This argument is very much of "evergreen" and we may be trying into something in trying to answer it. Basically, the blade of a screwdriver, held in line with the screw, cannot confer any mechanical advantage so that, considered alone, the length of the blade would not be important.

However, there are two other factors which are important and which are very practical.

Firstly, a longer blade often makes it possible for the arm to assume a better working position and, especially if supplemented by a bigger handle, allows much more pressure to be exerted by the person using it.

Another factor is that a person working on a stubborn screw with a long-handled driver is likely to twist it deliberately to one side, applying a combined twisting and lever action to the handle. This would represent a mechanical advantage—provided the head of the screw will stand up to such treatment.

Summing up, our answer would be this: A long screwdriver blade does not itself confer any mechanical advantage but it may allow the person using it to bring more pressure to bear on the screwhead. In difficult cases, therefore, the average person will look for a fairly long-bladed driver — with a good handle!

Needless to say, the blade of the screwdriver should be at least as wide as the screwhead and fit the slot as accurately as possible.

Q: Have salvage experts any hopes of raising the Italian luxury liner Andrea Doria, sunk in the Atlantic by a collision with the Swedish ship Stockholm?

A: Plans are well in hand to raise the sunken liner or, at the very least, to get it into water which is shallow enough to allow divers to salvage cargo and cut up the remains for scrap.

The plan is to use huge inflatable rubber bags, weighing two tons apiece and measuring approximately 52 by 15 feet. The bags were originally devised by the U.S. Rubber Company for hauling and storing bulk liquids but salvage engineers plan to attach them to the sunken hull, then inflate them in a carefully planned sequence.

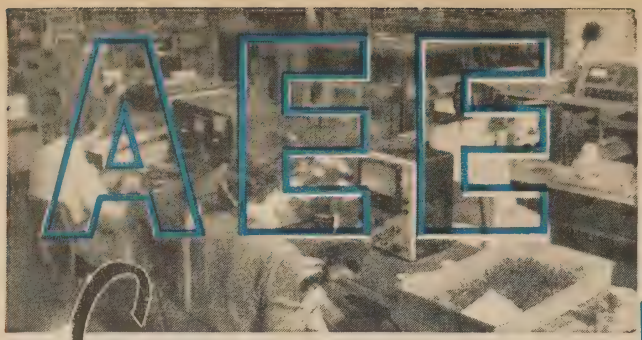
By using enough bags, they expect to bring the liner upright and just about cancel its submerged weight. Then huge steel cables will be passed under the hull, attached to ships or pontoons on the surface. By flooding the surface ships' holds, shortening the cables, then pumping the holds empty, the sunken liner will gradually be worked into shallow water.

Q: Are wooden fence posts still a proposition or are they likely to be superseded by more modern materials?

A: The answer is "no," according to a report issued by the Forest Products Division of the C.S.I.R.O. Under simulated strain conditions, 5in diameter posts of Long-leaved Box and Swamp-Gum failed at loads respectively of 5,700 and 5,300lb.

Similar tests on substitute posts, which were available as alternatives, showed the following figures: Reinforced concrete, 450lb; pre-stressed concrete, 900lb; Y-section steel, 240lb.

Observation also shows that treated wooden posts have a life of 30 years or more, which is not bettered by available substitutes.



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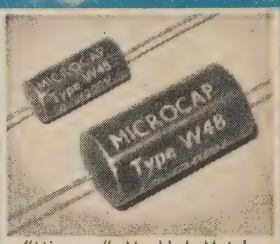

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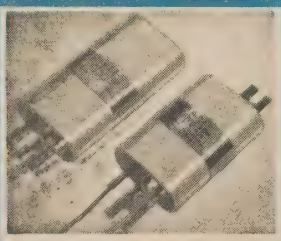

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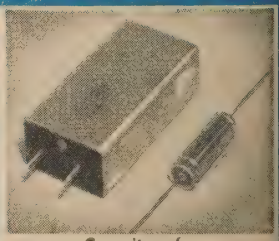

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oms to dig harbour

E possibility of using the power of the atom to "dig" a harbour on hore of the Arctic Ocean is being ed by a teamof scientists in Alaska. ey are led by Dr Edward Teller, ll-known physicist, who has done nuclear research and is a director e radiation laboratory of the Uni- y of California.

en he arrived in Alaska about the e of July, accompanied by other is region also has oil provinces could be exploited.

from such operations could be ported to a new port by pipeline.

bers of the scientific expedition, he that a harbour on the north- rn Arctic shore of Alaska would be by a nuclear powered explosion und feasible."

e site to be examined is near con- able natural treasures which lie dor- because of its remoteness and the of transport.

is south of Poine Hope, Alaska, be- Cape Seppings and Cape Thomp- n an area known to have deposits e finest quality coal.

e construction of a harbour would the mined product to be shipped by sea during the three ice-free hs, while coal mining operations l presumably be carried on all the round.

oculations by jet

E U.S. Army has taken delivery of new "shotgun"—for mass inocu- s.

own as a "multidose jet injection ," it replaces the old-fashioned e and syringe.

looks and is about the size of a istol.

Army doctor said, "The conven- needle is replaced by a jet tip with -thousandth of an inch opening.

ne serum or vaccine is forced with of power provided by a hydraulic- ted spring in such a manner that uid makes its own opening into the It happens so quickly there's no

Art from being more economical afer than "the needle," the new has a solid psychological value, rs say.

Commonwealth Director of Health, R. Wiburd, said that his depart- n was "extremely interested" in the

Other medical opinion warned that e method of controlling the depth injection beneath the skin had en worked out.

ow pipe Hunt birds

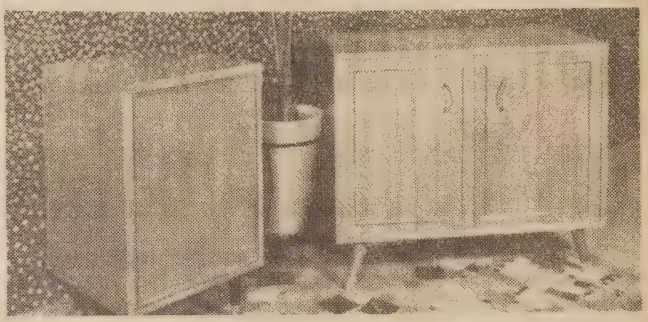
Acting Director of Native Af- airs, Mr J. H. McCarthy,on a recent Kandrian, New Britain, described he natives of that district used pipes to hunt birds.

y were the only known natives in hole of Papua-New Guinea to use pipes, he said.

en to 20ft hollowed-out reeds ere joined in three places were Because of their length, two usually went hunting together. unter holding the far end as a ion finder."

athered dart of black palms was Mr McCarthy said the natives t tip their darts with poison like rican tribes.

HI-FI



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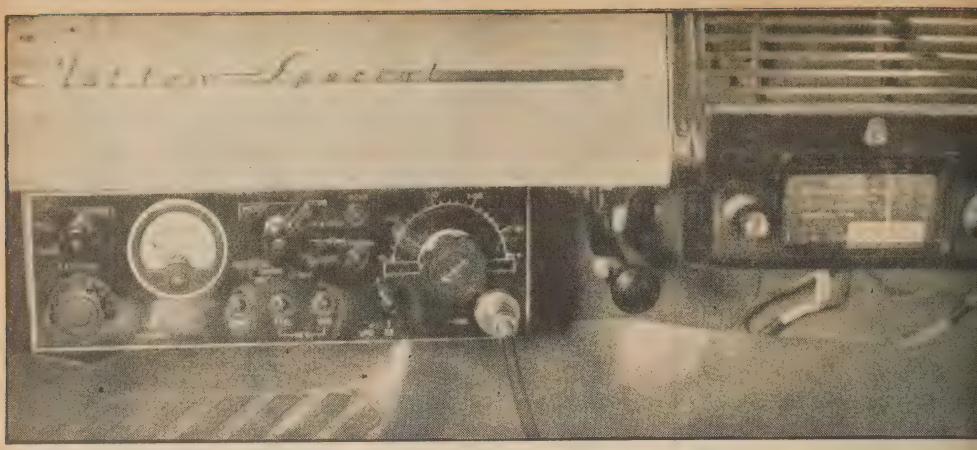


Our 7 Mc mobile equipment is installed under the glove box compartment of the car. So little space is occupied that it be left permanently in place without interfering with passenger legroom. The car's broadcast set is used as a tunable IF cha for the receiver.

Transmitter/Receiver For Mobile Amateurs

Problems in the design of a mobile amateur radio station are discussed in this article which includes details of a neat and compact installation operating on 7 Mc. It may be read in conjunction with the article on mobile aerials which appeared in the July issue.

MOST amateurs have their own ideas on design, which is all to the good, because a major part of what is to be gained from amateur radio comes from the design and construction of equipment. No one equipment is likely to suit all amateurs.

We therefore regard this article as collection of ideas relating to amateur mobile stations with a successful design used to illustrate how these ideas can be put into practice.

AMPLITUDE MODULATION

The discussion is confined to amplitude modulation systems which are used by the majority of amateurs at the present time. There is no doubt that FM and SSB systems have much to offer. The difficulty is that the equipment tends to become more complicated and not all amateurs have the time or the resources to complete and adjust it.

The earlier article gave reasons for the choice of frequency. Briefly, the 7 Mc band is well populated by both city and country amateurs and is suitable for local as well as interstate communication. This applies to mobile stations which by necessity have relatively inefficient aerials as well as to the best fixed stations.

Even amateurs who work mainly on the 14, 21 and 28 Mc DX bands usually maintain 7 Mc equipment so that they can keep in touch with local and interstate friends. The VHF gang find a 7 Mc a reliable communication channel for making test schedules.

Literally hundreds of designs for transmitters of the power level considered practical for a car installation have been published in overseas magazines. Likewise the requirements for an efficient 7 Mc receiver are well-known The problem is therefore not so much a matter of producing 7 Mc equipment but of producing 7 Mc equipment suitable for installation in a car.

Since cheap disposals equipment has so much affected the thinking of amateurs since the war, some comment is justified. The workmanship in most

by Maurice Findlay

of these sets is very good most amateurs would find it to produce equipment of co able standards. Further, ma the sets do cover the 7 Mc and are designed for battery tion.

First thoughts would be some of this equipment, say modifications here and there, enable an amateur to obta excellent mobile station che

In practice it doesn't wor that way. The audio qua rarely good enough by an standards, the physical size is u too great and/or the power supp quired is of an inconvenient v Many of the military equipments battery valves which are not suitab connection across an accumulator charge.

Eight volts across a normal battery or 16 volts across a norm volt accumulator are not uncomm the end of the charging cyc approached.

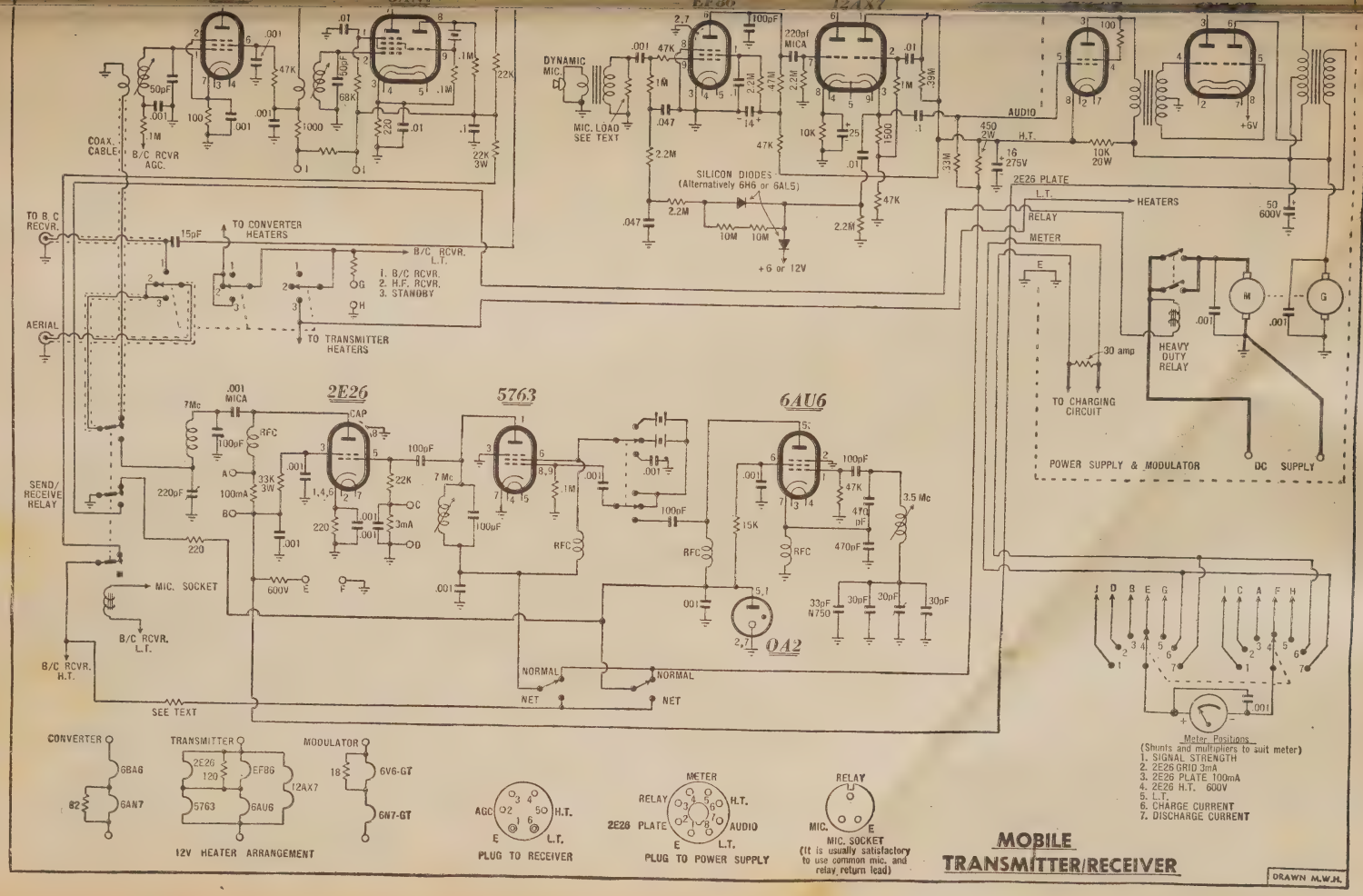
TIME CONSUMING

By the time all practical modific have been carried out it will usua found that almost as much tim been spent as if a new equipmen been constructed from the grou But even then the finished insta is not completely satisfactory

After a number of experiences different types of disposals equi our own feeling is that it is far satisfactory to start from scrat

By this we do not suggest that use cannot be made of individua posal components. There are ple useful valves, transformers, meter which are available at a fraction o original cost. Beautifully const genemotors which may cost £20 o in the normal way are available t disposals dealers for a couple of or less.

Incidentally, an article on mo 28 volt genemotors for 12 volt op which appears in "Readers Bui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3. STANDBY
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2E26
5763
6AU6
0A2
SEND/ RECEIVE RELAY
MIC. SOCKET
B/C RCVR. L.T.
B/C RCVR. H.T.
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(It is usually satisfactory to use common mic. and relay return lead)
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1. SIGNAL STRENGTH
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3. 2E26 PLATE 100mA
4. 2E26 H.T. 600V
5. L.T.
6. CHARGE CURRENT
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of this issue may help you to
n power supply cost.
we have already said, the mech-
side of 7 Mc equipment is all
ant. It must be able to withstand
bration to which it will be sub
when the car is driven over rough
Above all, it must be easy to
and out of the car for service.
mateur worthy of the name will
o make small modifications from
to time after the equipment is
d. Components fail in service and
volved procedure to remove the
r service can make it completely
factory.

CONNECTIONS

plugs, coaxial connectors, etc.,
be reliable and easy to undo. If
s more than a couple of minutes
the set out of the car for check
re likely to become very tired of
peration before its useful life is

amount of space equipment
be allowed to occupy is an in-
al matter. Apparently there are
can amateurs who are prepared
mpletely fill the rear compartment
car with all sorts of high-powered
ment including auxiliary petrol
s.

personal view is that, if possible,
mateur equipment should not oc-
any space in the car which is
or other purposes nor should it
any very heavy items which may
o overload the car when it is
g a full complement of passengers
ggage.

rules out many of the disposals
uxiliary petrol driven charging
dditional accumulators, etc.

t pleasure is to be gained from
quipment when operating away
home on holiday or perhaps on
ness trip, this being the very time
the car tends to be overloaded.
vary widely and it is a matter
king around your own particular
determine what space is avail-
The glove box is often used but
to reserve this space for maps
ther small but important items
seem to be needed around a car.
y a few cubic inches can be found
the instrument panel or around
sering column.

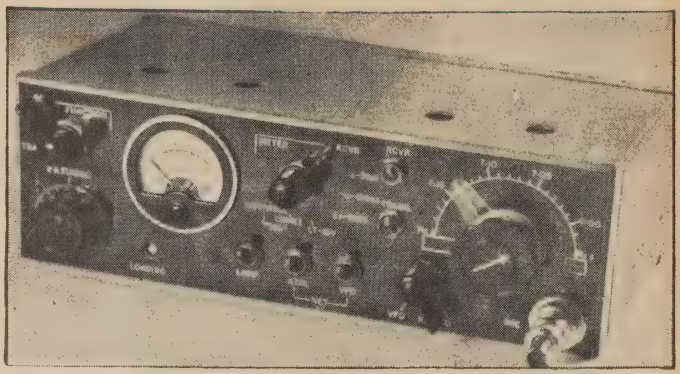
TE CONTROL

he available space is too remote
he driving position to permit easy
on of controls, it is often pos-
o install a remote control unit
connecting cables. With certain
controls, the remote control unit
nly contain the tuning capacitor.
nnection with the remote oscil
eing made via coaxial cable. The
at the capacity of the cable is
allel with the tuning capacitor is
not prohibitive.

our own installation, a spot un-
e glove box on the left hand
as found and the set constructed
h a size that it can be left in
without interfering with the nor-
e of the car in any way.

amount of transmitter power you
ord to run depends on a number
tors, many of which, again, are
and/or concerned with the
y of the generator and battery,

FRONT VIEW SHOWS ALL CONTROLS



Front view of mobile unit. Along the top, from left to right, are the function switch, meter, meter switch, indicator lamps and VFO dial for the transmitter. At the bottom, the power amplifier tuning control, loading control, panel lamp switch, crystal and VFO net switches, VFO/crystal switch and microphone socket. Overall dimensions are 12in by 7in by 4in.

not to mention the amount of running you are likely to do.

The Holden is typical of modern cars used in this country and a discussion of its electrical system should at least serve as a basis of comparison. A 12 volt system is used and both voltage and current regulators are fitted to protect the battery from overcharge and the generator from overheating respectively.

With the battery discharged, the generator charge rate is limited to 20 amps, most of which is available for the radio when running during daylight hours. However, only about half of this, depending on which headlight beam you are using, is available when running at night.

Not all transmitting will be done with the car in motion. Therefore the capacity of the battery to supply the transmitter without the generator charging is of very great interest. The ampere-hour capacity depends on the discharge rate, being greatest for slow discharge rates and least when heavy currents are being supplied.

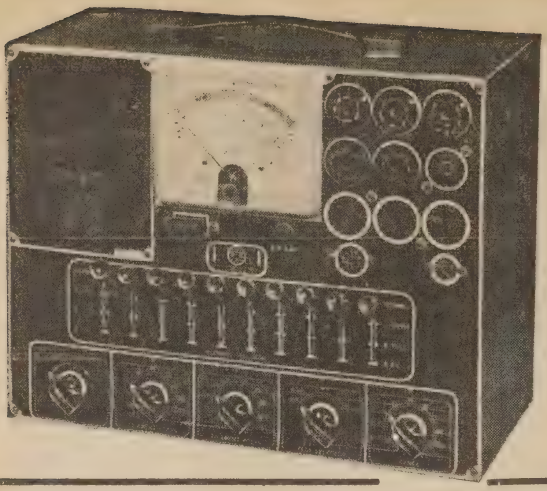
At high currents such as are used for starting the engine the capacity of a battery of the size normally fitted to the Holden is 30 AH while at slow discharge it can be over 70 AH. It would be reasonable to expect a new battery to have a capacity of around 50 AH at the discharge rates likely to be encountered with amateur transmitters.

AGEING BATTERY

Not all this is available for operating the radio because some reserve must remain for starting the engine and an allowance must be made for reduced capacity of a battery toward the end of its life. Our suggestion is that it would be unwise to count on more than about 20 AH.

The current drain of a typical receiver and transmitter heater system would make up something of the order of 4 to 5 amps at 12 volts while the total

The power unit is installed in the engine compartment where short leads to the battery are possible and genemotor sound is effectively damped by the car's normal insulation.



VALVE TESTER MODEL TVT.

This is the latest in valve testers an is flexible over a very wide rang allowing all types of tubes to be tes ed irrespective of their pin connec tions. Individual lever switches ar used for every pin, and a range o twenty filament voltages allow al types of tubes to be tested quickl and accurately. It is designed fo ordinary radio use as well as fo testing TV tubes, and can be used a a portable instrument or bench in strument.

TWO FAMOUS UNIVERSITY
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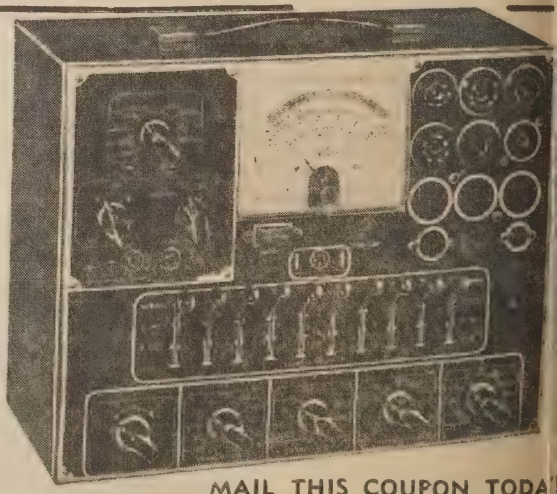
VALVE AND CIRCUIT TESTER MODEL TST/2

The Model TST needs no introduction to the radio and TV service industry in Aust ralia, and Model TST/2 is built on the same basic principles of good quality and lasting service, but with improvements to allow testing of TV tubes and to give it a more flexible range than TST. As well as having all the features of Model TVT valve tester, it allows AC/DC and output voltages to be checked up to 1,000 volts together with a range of D.C. current up to 250 milliamperes and self-contained resis tance ranges up to 10 megohm. Designed to operate from A.C. it is supplied with instruction booklet and test leads.



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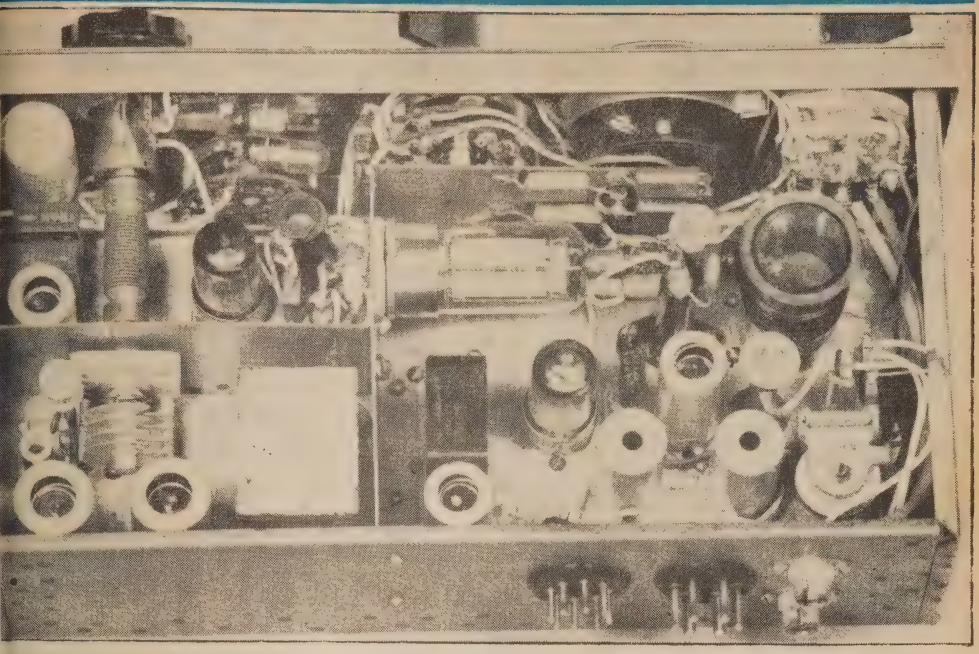


view of transmitter unit. The VFO valve and tuned circuit is at the middle left with the two transmitter crystals above. To the t we see the 5763 and its tuned circuit and then the 2E26 mounted horizontally followed by the output tuned circuit. From right eft along the bottom are the changeover relay receiver aerial coil, 6BA6, RF coil, 6AN7 and crystal. The voltage regulator tube is below the crystal. Moving again to the right, we pass the mic. transformer, EF86 and 12AX7.

on transmit could be from 15 to mperes in the case of a reasonably powered installation. Depending on transmitting habits it would be able to expect the battery to the station from between one and ours without assistance from the tor.

is doesn't seem long but in practice ally all you require.

cussion so far has been around the t drains likely to be encountered ith transmitter power inputs up to watt level. At the other extreme, successful transmitters with power of the order of 5 watts have been ucted. They are relatively easy on ttery but you can't expect to get h under adverse conditions where) watt station may be successful, bering that the best practical a has a radiation efficiency of the e of 10 per cent.

RMAL" POWER

decision is a personal one but he usual order of power supply icy and other factors mentioned uggestion is that you regard a sitter with a DC input to the plate final amplifier of 20 watts as a normal for mobile work. If you ner you must be prepared to watch ttery carefully. If lower there may ies when you will not get through e of atmospheric conditions or rting stations.

he are some who may be prepared to install additional equipment to permit operation at higher power when necessary. A relay could bring a higher voltage power supply into operation when required, for example.

The electrical design of the equipment may vary greatly and the circuit published is only one example of a successful design. Before talking about the circuit in detail, it may be of more help to those who propose to build a unit using parts they already have if the general requirements are outlined.

RF SECTION

First of all, we will deal with the radio frequency section of the transmitter. Some means of controlling the frequency of the transmitter accurately is required. Fearing that the vibration of the car would affect the frequency of a variable oscillator many amateurs have used crystal control.

There are times, however, when conditions on the 7 Mc band make a variable oscillator essential for effective operation, not only because of the possibility of interference but because it has become the accepted practice for stations to send and receive on the same frequency.

If a VFO is used, some means of checking its frequency is necessary. this usually takes the form of a crystal oscillator with which the VFO can be hetrodyned. If you are prepared to install a pair of band edge crystals for checking, accurately calibrate the VFO and voltage regulate the power supply to all oscillators, it may be possible to obtain P.M.G. permission to dispense with the requirement for a separate frequency meter when operating mobile.

Alternatively, one or more crystal positions for controlling the frequency of the transmitter may be very useful for keeping skeds, etc.

Having installed a suitable frequency determining system it remains to build the power up to the level required at the final amplifier. At 7 Mc it is usually only necessary to use one multiplier stage and sometimes the oscillator can be used to drive the final directly.

There are many valves which could be considered for the final amplifier and depending on the power required, you may choose from types 6AQ5, 6V6, 5763, 2E26, 807, 6146 and many others. The first three are suitable for lower powered installations and require neutralisation. The last three will handle the highest power you are likely to require and usually do not need to be neutralised.

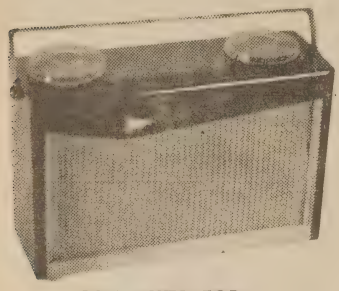
AERIAL COUPLING

The power amplifier will normally be fed into a low impedance co-axial line and some means of varying the coupling is required. A variable link is worth considering and also a pi network which lends itself to easy and precise adjustment of loading in a mobile installation.

Plate modulation is usually most

R.C.S. TRANSISTORISED PORTABLE RADIOGRA

The same printed circuit boards and coils as used in the "transporta" portable will build you this new transistor radiogram.



COIL KITS FOR:

Either the transistorised portable or the portable radiogram. Part No. 560 consists of:

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Part No. 175	2nd I.F.

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Suitable for transistor portable or radiogram.

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Current D.C.: 500, 50, 10, 1 milliamperes. 100, 50x microamperes. x Obtained by using the 2.5 volt D.C. range.

A.C.: 5, 1, 0.5 amperes.

Resistance. 0-10,000,000. 0-100,000. 0-1000. 0-100 ohms

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CARRYING CASE. The model E.772 is supplied at a price inclusive of a moulded carrying case which contains the instrument, two pairs of test leads and instruction card.

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Model M.32 32 range multimeter is indispensable for modern radio and electrical installation and service.

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Volts A.C. 0/3-10-30-100-300-1000	6
Current D.C. 0/1-3-10-30-100-300 mA. -1-3-10 amp	9
Current A.C. 0/1 mA (for use with ext. current transformers)	1
Ohms 1-10 megohms.	3
Decibels Ref. level 1mW. in 600 ohms	3
Decibels Ref. level 6mW. in 600 ohms.	3
TOTAL	32

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D.C. m.a	0/1	0/10	0/50	0/250
Ohms	0/1000	0/10.000	0/100.000	0/10 Megohms

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tory. Overall efficiency can be
ed by operating the modulator
in class B so that the current
nder no modulation conditions is
w.

thing which can be done to make
odulation more effective is worth
ering. Extreme low frequencies
be attenuated because they ab-
nodulation capacity without con-
ng much to intelligibility of
Modulation components above
.4 Kc should be attenuated to
occupying unnecessary bandwidth.

difficult to keep the voice level
nt at any time but when operating
it is almost impossible. Some
of automatic gain control is de-
. Preferably it should be quick
on loud transients but should re-
relatively slowly so that the aver-
itput tends to be governed by the
of speech.

vided the high frequency distortion
nents are removed by a suitable
ass filter, peaks of speech can be
ed by a clipping system and the
e level increased within the modu-
capability of the transmitter. An
se in average level of from 6 to
can be obtained with little obvious
ion.

CTED BY HEAT

ile crystal microphones are an ex
t and popular choice for normal
ur installations they do tend to
t the high temperatures which can
countered in a closed car in our
alian summer. Carbon micro-
s are excellent from the reliability
of view but fall down severely on
atter of quality.

s leaves the dynamic mic. many
ent examples of which are avail-
hrough the normal channels both
and without built-in transformers.
nic mic. inserts were used in sev-
f the disposals sets and during the
nd since have been found to be
ent from the point of view of
lity.

erious disadvantage of these in-
is that they exhibit a number of
s peaks toward the upper end of
nge. However, at the expense of
it is possible greatly to reduce
eaks and give the mic a charac-
comparable with a crystal by
g it into a lower than normal

one case we used a transformer
ed to match the mic. to 50,000
and found that excellent quality
be obtained if a 10,000 ohm load
connected across the secondary.
experiment with the load will be
ary depending on the condition of
ert, the transformer and the qual-
u are willing to accept.

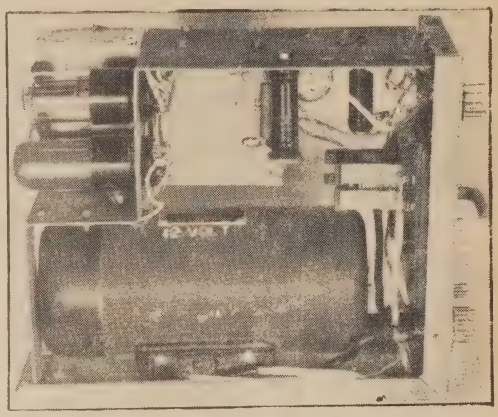
LDED TRANSFORMER

idless to say, a magnetically shield-
nsformer is necessary and this
be very effective if the mic. trans-
r is to be used in the vicinity of
motor or vibrator transformer.

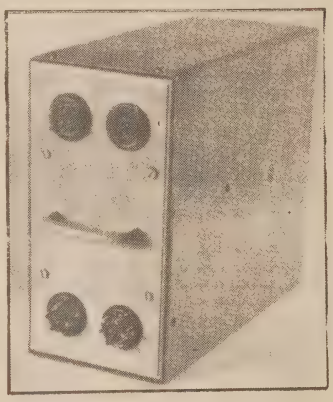
rision of high tension for the
itter is another problem to be
by the designer of mobile equip-
nt Vibrators are one possible solution
ave the advantage that replace-
nt and all associated components are
ible new through normal trade
ls. If more power is required than
obtained from a single vibrator,
two supplies can be operated in parallel. Individual vibrators should not be operated in parallel.

There are special high power dual-interrupter vibrators which are suitable for some installations while synchronous vibrators sometimes enable power to be saved by eliminating the rectifier valve.

A moderate amount of filtering is usually sufficient to prevent vibrator interference getting into the mic. channel and one of the standard circuits will usually work without extensive experimental work. A big advantage of vibrator supplies is that they are practically instant starting and, if vibrators with separate driving contacts are used, the high tension can be switched on and off without a large primary relay.



Right: Inside view of the power supply compartment. Below: Outside view. At the top left is a 4-pin plug which completes the connection from a shunt in the battery circuit through to the meter and at right the outlet socket to the transmitter. Six and 5-pin plugs with all pins in parallel are used for the positive and negative LT leads respectively.



On the other hand genemotors are available in sizes which will handle the highest power likely to be required, are extremely reliable and require very little filtering. A big factor which may influence readers to use them is that they are available from disposals dealers at small cost. If vibration is not to be transmitted to the car body an effective mechanical insulator is required. In general mounting of a genemotor in the passenger compartment should be avoided.

Genemotor starting current can be quite high. A relatively large relay is required and heavy battery leads should be used so that the machine can be brought up to full speed as quickly as possible.

The receiving section of a mobile station demands considerable attention and the possible variations are, if anything, greater than in the case of the transmitter.

The chances are that there is already an excellent broadcast receiver in the car. It would mean a considerable saving in cost and overall equipment carried if it could be made to serve as part of the mobile installation.

A frequently used arrangement is to install an auxiliary crystal controlled converter which obtains both its heater and high tension power from the receiver. The system then becomes a double superhet. with the first IF variable.

There are a number of disadvantages in the arrangement and it is justified mainly on the grounds of simplicity and low cost. One disadvantage is the possibility of strong local broadcast stations getting directly into the broadcast receiver and interfering with signals from weak amateur stations coming through the converter.

A good cure is to ensure that the converter has high gain on the amateur band. An RF amplifier plus converter valve is usually satisfactory. Inductive coupling is to be preferred to capacitive coupling between stages.

The intermediate channel of most car radio receivers consists of a single stage operating at 455 Kc. The selectivity is much less than is desirable in an amateur band communication receiver. It is usually difficult to install additional stages to increase the selectivity and in any case the dial mechanism of most car receivers is not good enough to permit easy tuning with greater selectivity.

SELECTIVE FILTER

One possible solution is to install a highly selective filter between the converter and the broadcast receiver, retaining the latter to provide gain, audio power, etc. Practical considerations make it necessary to design the filter for a single frequency and therefore it is necessary to tune the oscillator section of the converter. A smooth vernier dial and circuits to give adequate bandspread can easily be included.

Quartz crystals have frequently been used and given suitable circuitry are capable of excellent results. If you don't mind complicating the arrangement, there is the possibility of including a variable selectivity control and perhaps a phasing control so that the rejection

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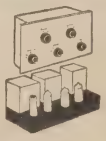
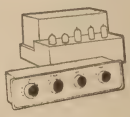


Rogers RD Junior. Since it was first introduced, the RD Junior has achieved and maintained world leadership in the medium - priced amplifier field.



Aegis Mullard 510. Australian mode, a very fine low-priced amplifier. Matching tuners also available.

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AXIOM 80

AUDIOM 60

AUDIOM 80

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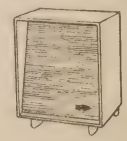
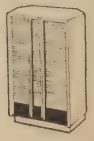


Sherwood Cabinet. Designed for the Goodmans Axiom 12" loudspeakers, used with or without the Trebax high frequency unit.



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an be used to attenuate hetro-
A practical difficulty is that crys-
ound for frequencies within the
st band are likely to be expen-
d difficult to obtain.

ner possibility which we hope to
y soon is the use of a series of
toroids loosely coupled in cas-
form a radio frequency filter.
t ferrite materials are avail-
relatively low cost. The permea-
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xcess of 300. Therefore only a
ns of wire will be required and,
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obtain all the selectivity that
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oint in using toroids rather than
rms of tuned circuit is that the
n be placed close together, with-
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er.

iscussion on mobile equipment
stage could be considered com-
ithout mention of transistors.
uitable for the entire audio am-
nd modulator chain are now in
ly good supply and 10 watts of
ould be obtained fairly readily
12 to 14 volt supply.

D DESIGN

there are no transistors suit-
the radio frequency power am-
nd perhaps the frequency multi-
age of the transmitter, valves
e employed and their high ten-
plied via a transistor DC con-
mploying a pair of audio type
ransistors. The efficiency of such
y is likely to be of the order
r cent against 50 to 60 per cent
ibrator or genemotor supply.

transistors suitable for the RF,
nd oscillator stages of the re-
re not, as yet, generally avail-
e have handled samples and
constructed an effective transis-
crystal-controlled 7 Mc conver-
nsistors suitable for the IF and
id of a communication receiver
in the shops.

average power consumption of
etely transistorised station could
one half or less that of equip-
ing valves of equivalent power.
iggest objection is cost. Power
rs suitable for the job sell at
and four would be required for
ulation of reasonable power.
rs suitable for use in the con-
7 Mc are likely to cost from
24 each. It is difficult to reduce
ber required to below three.
it would not be hard to spend
transistors even before you start
neters, resistors, capacitors and
other components. For most
, the cost would be out of the

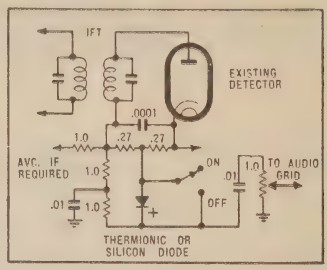
OF EXPERIENCE

r, most of us have not had
experience with transistor cir-
be sure that a first design
e completely successful. An
cuit would have to be designed
r, constructed in a suitable
form and then given an ex-
eriod of test and, most likely,
ion before a final design could
ved

gh paper figures suggest that,
itable compensating circuits,
germanium transistors would be
operate successfully at the tem-

peratures encountered in cars in the Australian summer we would like to see this demonstrated with a complicated piece of equipment before recommending a design to readers.

The circuit of our amateur mobile installation is published here, together with some photographs which give an idea of its physical form. We have not prepared details of the chassis and case because we feel that readers will have



Noise limiter circuit.

individual ideas on this, depending on the car and available components.

The receiving section uses a crystal controlled converter with a 6BA6 and a 6AN7. The former is chosen for the RF stage because of its fairly high gm combined with a variable mu characteristic. AGC obtained from the broadcast receiver through the connecting cable is applied to the grid of the 6BA6 and enables the mobile station to be moved quite close to powerful stations before distortion or cross modulation effects become apparent.

Strength of incoming stations can be measured by means of a meter placed in the plate circuit of the 6BA6 or, better still, the meter can be connected into a suitable circuit in the broadcast receiver where it can serve as a tuning indicator

COIL GUIDE

CLAPP OSC: 65T 32 B & S enam. close wound on ¼in diam. slug tuned former.

5763 PLATE: 25T 24 B & S enam. close wound on ¼in diam. slug tuned former.

2E26 PLATE: 20T 18 B & S close wound on 1¼in diam. former.

RECEIVER AERIAL: Pri. 10T 28 B & S enam. wound over bottom end of secondary.
Sec. 50T 28 B & S enam. close wound on 8mm slug tuned former.

RECEIVER RF: Pri 25T 28 B & S enam. wound over bottom end of secondary.
Sec. 50T 28 B & S enam. close wound on 8mm slug tuned former.

for both broadcast and amateur stations There are vacant connections on the plug going to the broadcast receiver for this purpose.

The frequency converter circuit is as simple as possible and there should be no difficulty in getting it into operation. The overall gain of the combination is quite high and we did not have any trouble with broadcast band interference even when right up against a powerful station

High tension is obtained from the broadcast receiver through a dropping resistor. The total current drain is between 3 and 6 mA and therefore well within the capabilities of any well designed car radio to supply. The performance of the converter at the low high tension voltage is excellent.

Crystals between 5.55 and 6.45 Mc will permit tuning of the 7 Mc band with the oscillator on the low side of the signal and between 7.7 and 8.6 Mc with the oscillator on the high side. If there is any choice, we suggest that you choose a crystal as near 6.45 Mc for the former or 7.7 Mc for the latter as possible since the bandspread of most car receivers is greatest near the low frequency end of the band. Changes in crystal frequency with supply voltage are negligible and voltage regulation is unnecessary.

This converter scheme is suitable for operation on the 35 Mc band if required and by relying on harmonics of the crystal for mixing, would work well on 14 Mc. Coil details would require modification accordingly.

ESSENTIALLY SIMPLE

Although this simple crystal controlled converter system has the disadvantages with regard to selectivity mentioned earlier, it does represent a simple and fairly satisfactory method. We have managed to work lots of interstate stations even when the band was very crowded. At the same time we hope to be able to try out some other schemes and pass the results on to readers.

A serious defect of ordinary car receivers for mobile work is the lack of a noise limiter. We have published a very simple circuit which we have found to be effective and which you may care to try. A valve such as a 6AL5 or a 6H6 may be used, or one of the new silicon diodes which have a very high back resistance. None of the germanium diodes we have tried have proved to be satisfactory.

Care should be taken in choosing the connection point and the method of connection to the broadcast receiver for obtaining the LT, HT and AGC since these wires can act as a means of introducing interference into the set on both broadcast and shortwave.

While most car receivers have a trimmer which enables the aerial circuit to be brought into line with varying connecting cable and aerial capacities, it is possible that the extra capacity introduced by the connection of the switching circuits and coaxial cable will mean that a peak cannot be obtained.

AERIAL CIRCUIT

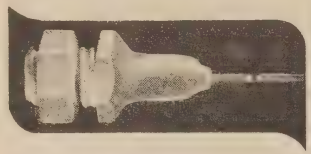
Careful consideration of the problem is required if best overall results are to be obtained. Note that the aerial described in the July issue does not give good results on the broadcast band if the 680 pF capacitor is used. Without the capacitor, it works quite well, even through a relatively long cable.

A function switch controls the aerial and heater circuits to permit reception of broadcast stations in the first position, amateur stations in the second, and bring the heaters of the transmitter into operation in the third.

We chose to obtain the heater and relay supply through the broadcast receiver so that the station could be quickly switched off with the one switch when you get out of the car. If you have a 6-volt car it may mean heavy wires to avoid excessive voltage drop, but there

MINIATURISED RADIO & TV Components

DUCON



TYPE CAE—Screw mounting stand-off variety in capacity ranges of 100 pf. min. to 3000 pf. max.

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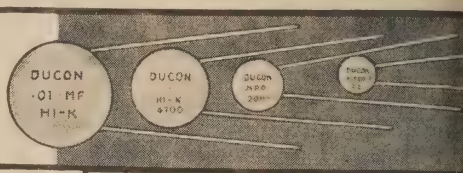
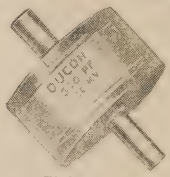
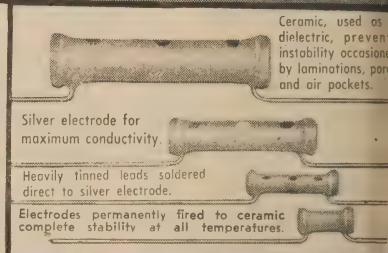
The disc ceramic, with its short rf current path, when soldered direct to the tube terminals, reduces the inductance to very small values.





Type TV high voltage disc capacitors encased in "DURITE" for T.V., and other high voltage applications



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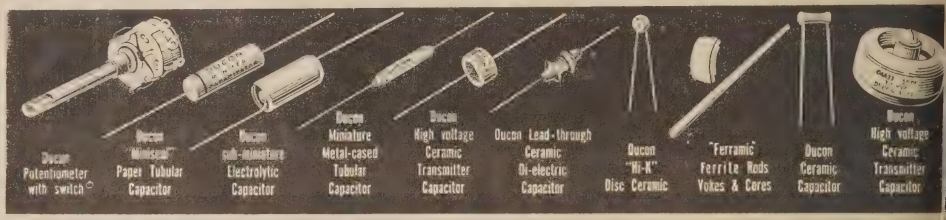
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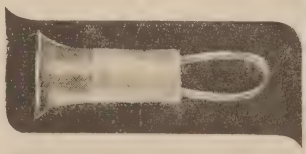

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likely to be any difficulty with a
t system. The system may save
nding the car with a flat battery
me.

ve lineup of the transmitter is a
which functions as an electron-
d Clapp oscillator, followed by a
mplifier-multiplier. The 5763 can
nction as a crystal oscillator-mul-
depending on the setting of a
n switch. A 2E26 is wired as a
amplifier, with the grid and plate
s tuned to the same frequency.

ough the transmitter was originally
ed for 7 Mc operation, it would
e suitable for a 3.5 Mc and 14
th minor modifications. For 3.5
tput the Clapp oscillator should
erated at 1.75 Mc and the 5763
as a doubler.

4 Mc output is required, we sug-
hat you tune the Clapp oscillator
Mc, replace the RF choke in the
ircuit of the 6AU6 with a 7.0 Mc
circuit and double to 14 Mc in
63. The crystal oscillator would
ly provide ample drive with 7.0
ystals, but may not do so with 3.5
rystals.

P OSCILLATOR

Clapp oscillator was chosen for the
ecause the loose coupling between
equency determining circuit and
lve tends to make the frequency
illation independent of changes in
apacities and supply voltages. The
alve for this circuit has the highest
f gm to change in input capaci-
during the warm-up cycle, and
y the 6AU6 is excellent in this

e 5763 is frequently used as a
oscillator but requires greater
power, and its higher gm is offset
ater input capacity. If you wish to
5763, increase both capacitors
as 470 pF on the circuit to .001

Clapp oscillator circuit will not
t drift due to changes in the main
ncy determining capacitor or in-
In order to make a compact
e have included these in a single
ith the high power circuits and,
re, subject to some heating. The
ment, using a negative temp.
apacitor shown, will reduce the
o negligible proportions. With
xperiment, it should be possible
ce the total warm-up drift to less
00 cps.

NT RIGIDLY

uency shift due to vibration can
iced to negligible proportions by
sure that all components are
ically sound and firmly mounted.
iginal could be shifted about 100
means of a solid thump when
bench, but reports from other
s indicated undetectable shift
car on the roughest roads.

voltage regulator tube is to some
luxury, since the frequency shift
e likely change in supply voltage
l. It is connected so that it is
across the VFO HT line and
rves the crystal oscillator when
er is used to check the VFO.

witching arrangement allows the
nd/or the crystal oscillator to be
l from the receiver supply for
purposes. A series resistor is
on the circuit but its value will
on your particular receiver.

Drain of the VFO is about 5 mA and the 5763 20 mA at 150 volts plus the current drawn by the VR tube.

Most receiver supplies will withstand the overload for a short period without damage, but the net switches should be returned to the normal position as quickly as possible. A saving feature is that the normal AVC action greatly reduces the current drain of the RF and IF valves of the receiver when the signal from either oscillator is present.

Drive for the 2E26 should be about 2.5 mA, which should be obtainable through either the crystal of VFO channels with ease. Output from less active crystals can be increased by connecting a small capacitor (5 or 10 pF) from the screen end of the particular crystal to ground.

FINAL AMPLIFIER

The 2E26 final amplifier is connected in a conventional circuit for plate and screen modulation. A protective resistor is included in the cathode circuit to limit the current in the case of detuning or failure of drive. Both plate and grid circuits are included in the metering system.

Loading is adusted by means of a compression trimmer while a 100 pF variable capacitor is used to tune the circuit for minimum current. In order to comply with manufacturers' recommendations the loading should be adjusted to 50 mA at 400 volts, but we have found that it is possible to increase this with increase in RF output.

Part of the audio amplifier chain is included in the passenger compartment case and part in the power supply case in the engine compartment. Output from a disposals dynamic insert is fed through a length of unshielded wire to the primary of a mic. transformer mounted on the transmitter chasses.

By using a single conductor for the mic. and press-to-talk relay return circuits, it is possible to use ordinary power flex to connect the mic. housing. There was no observable interference from the LT line introduced into the audio circuit by this arrangement.

The mic. transformer used was taken from a wrecked No. 122 set and it was found that the secondary load had to be reduced to 4,700 ohms in order to effectively flatten the response. The output is then quite low but well within the capabilities of a special valve such as the EF86, to handle without ill effects.

As soon as speech begins some bias is developed at the EF86 grid by the AGC system and therefore it is possible to dispense with the usual cathode bias arrangement. A 47K resistor ½-watt resistor mounter right at the grid pin helps to prevent RF feedback. Higher than normal plate and screen resistors give increased gain.

COMPONENT VALUES

Similarly the resistors associated with the first 12AX7 section are fairly high. Attenuation only becomes serious at frequencies higher than are required in this application. The coupling capacitor between the EF86 is very low by the usual standards but low frequency attenuation is required for most effect effective modulation and the input resistor for the 12AX7 is 2.2 meg.

The second section of the 12AX7 is operated as a cathode follower and behaves as a generator with source imped-

(Continued on Page 119)

AWA RONETTE

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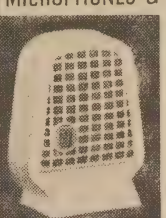

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Here's your answer, Tom!

y experimenters may have, at one time or another, constructed a vibrator type power ly. However, it is likely that many, whilst capable of constructing such a unit, did not or were in doubt as to its precise method of operation. Tom's queries have given us pportunity to explain the functioning of vibrator power supplies in the ensuing paragraphs.

transformer necessary in a r-operated power supply?

iswer, Tom, is a most emphatic vibrator without a transformer useless and will be of no more the ordinary buzzer. To help its principle of operation, the a conventional vibrator supply. he one used in our Kar-Set, is ed.

g at the circuit you will note vibrator consists of an electro- hich is energised by the battery, ng reed which forms a series n to the coil on the electro- vhen the reed is at rest, and acts on either side of the reed e connected to each end of the er primary.

ntre tap on the transformer pri- connected to a battery terminal that to which the reed is con-

normal position the vibrating at rest. When the circuit is urrent flows through the ener- l, thus causing the armature or reed to be drawn toward the the reed moves toward the coil ts with the contact marked (2) circuit, interrupts the flow of hrough the energising coil and rrent to flow instead through alf of the transformer primary. ondition lasts for only an in- electromagnet ceases to attract which springs back and, in its m, is carried on to connect with ntact marked (3) in the circuit. then flows through the second he primary.

IBRATES

the armature or reed is being ly attracted and released by the agnet, the reed continues to s long as contact is made to ry. Current flows first through of the primary and an instant ugh the second half, the action peated at a very rapid rate. bout 100 cps.

result, an alternating magnetic et up in the core of the trans- nducing an alternating voltage condary winding.

ding the transformer with many ns on the secondary than on the it is possible to keep the original voltage up to any desired figure. etween 150 and 300 volts.

lternating voltage available at dary may now be rectified in al manner and, after suitable becomes available as a high- ource for the receiver.

Is a rectifier necessary in a vibrator supply?

A rectifier is not always necessary in a vibrator supply. Tom, for a vibrator which automatically rectifies the alternating voltage may be used.

This type of vibrator is referred to as a synchronous vibrator and the circuit of a supply using such a vibrator is reproduced.

Looking at this circuit you will note that the main difference between this vibrator and the one discussed previously is the addition of two contacts which make connection with the reed, more or less in synchronism with the original two contacts.

As we have already pointed out, when the reed makes and breaks the primary circuit, it creates a magnetic field in the transformer core, which induces an alternating voltage in the secondary winding. This winding is centre-tapped.

As the voltage alternates, each end of the winding alternately becomes positive and negative with respect to the rest of the winding.

The idea, in the normal synchronous vibrator circuit, is to have the reed earth the alternate ends of the winding during the periods when they are at a relative negative potential. With the "negative" end thus earthed, the remainder of the winding including the centre-tap must be temporarily positive.

It follows that if the respective ends are earthed each time they become negative, the centre-tap must always be positive and, in fact, becomes the point from which a rectified positive voltage can be taken.

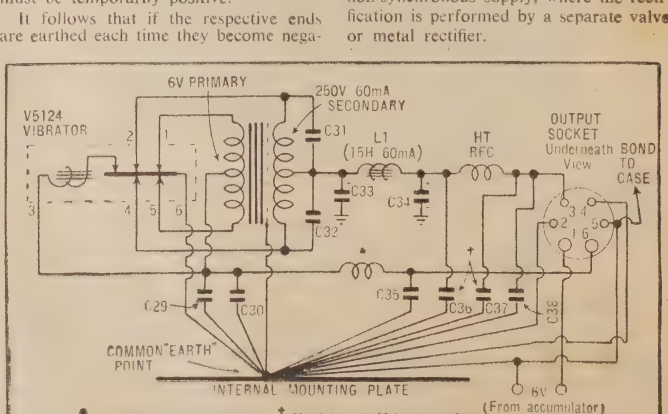
Very obviously, the connections between vibrator and transformer must be so phased that the negative end of the secondary winding is earthed by the relevant reed contact, otherwise the rectified output from the centre-tap will be negative rather than positive.

When wiring up a synchronous vibrator supply, therefore, it is usually necessary to make either the primary or the secondary connections in temporary fashion. The supply is then connected to a battery with the input leads to the positive and negative terminals as it will ultimately be used, and the DC output checked for polarity. If it happens to be wrong, then one set of transformer leads must be changed over.

POLARITY

The matter of polarity is vital in synchronous vibrator supplies used in cars, because one side of the battery is always earthed to the car body. However, different cars have the positive or the negative side of the battery earthed, so that the supply has to be wired expressly to suit the battery polarity in the particular make of car.

This difficulty does not arise with a non-synchronous supply, where the rectification is performed by a separate valve or metal rectifier.



Typical synchronous vibrator unit as used in an early "Karset."

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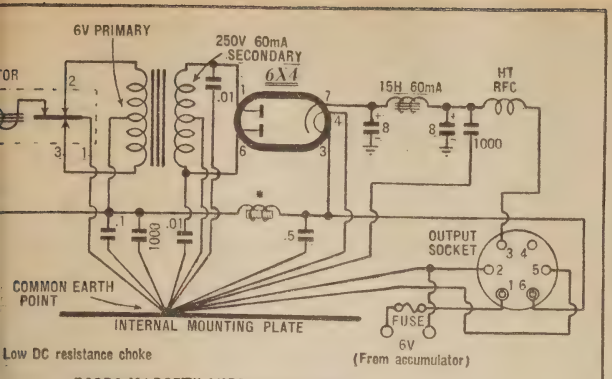

"1956 KARSET" VIBRATOR SUPPLY

A later "KarSet" used a vibrator unit with a rectifier.

en a tape deck is connected to plifier is it necessary to have -amplifier? If so, how is one cted?

wish to use a tape deck with ifier, more than a pre-amplifier required. To make a tape record- he first place, it is necessary to high frequency bias for the re- head which involves an oscillat- with its associated coil and nts.

heory behind the need to pro- h frequency bias is too com- detail in this article, but it is for low noise and distortion.

ame source of high frequency lso used for erase purposes.

ayback, the signal available from l is of quite a low order, and sential to provide a high-gain ifier stage between the head and al input terminals on the ampli-

ame stage is frequently used as rophone pre-amplifier when re- the output again being fed into lifier, thence into the recording

cilitate handling, some form of must be provided for record- purposes.

ENSATION

to this we should have sufficient compensation to ensure a rea- level response. To make the response linear over the usable y range, it is necessary to boost upper and the lower ends of e. Furthermore some means of ng the program being recorded e provided as well as a means rolling the recording level.

general requirements call for a ained unit often referred to as adaptor." The circuits are in- s a matter of course in a com- e recorder but, for use with an amplifier, they must be provided lently. Such a unit was described anuary 1953 issue, though it did provision for erase bias. It was by a second unit in the July ue, which featured a power oscil- the bias source to allow for elec- ase.

are contemplating the construc- tion of an adaptor, Tom, we suggest that you obtain copies of the issues concerned. Should you be unable to do so, we can supply the circuits through our query service.

Some time ago I came across an unusual fault in a radio receiver I was servicing. When I was reinstalling the chassis, with the set operating, I noted that the volume became weaker as the set was pushed right in. On examination, I found that the IF amplifier valve came to rest very close to the magnet of a 12in speaker. Pushing the valve toward the magnet confirmed my suspicions by causing an appreciable drop in sensitivity. Pulling the chassis out I simulated the effect with the aid of an old speaker magnet, with equal results. The same effect was evident with a new valve. I placed the magnet in close proximity to the remaining valves in the set without effect. Now my question is, can magnetic lines of force bend or attract the electron stream within a valve and, if so, why were not the remaining valves affected?

Your observations are quite correct for it is possible to bend or deflect the electron stream within a valve. Hence the presence of a magnet could quite easily affect the performance of a valve.

This point may be made considerably clearer by bringing to mind the fact that cathode ray tubes use this principle in their operation. Those tubes which are designed for magnetic deflection of the spot, do so with the aid of electro-magnets which are so placed around the neck of the tube as to deflect the beam through an angle of up to 110 degrees.

You may have also noted the effect stray transformer fields can have on the spot or pattern on the screen of a cathode ray tube, causing the pattern to weave.

In the same manner the electron stream within the tube may be deflected away from, say, the anode, with the result that only a small portion of the stream reaches the anode. This will naturally result in a drop in gain.

The precise effect that the magnetic field will have on the electron stream will be determined by the type of valve and its application. In certain cases the

(Continued on Page 119)

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Manual Player, variable speed adjustment, with 12" turntable, easy weight adjustment.

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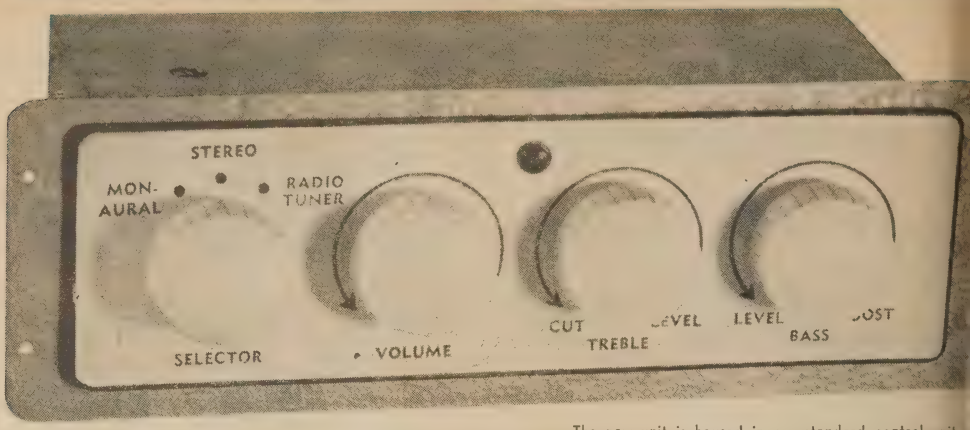


The new unit is housed in our standard control unit c
The panel shown is hand lettered but enamelled le
will doubtless be made available if demand warrants

A Stereo Control Unit For Crystals

As the stereo picture begins to clarify, it is obvious that pick-ups of the crystal type will play a big part in equipment design because of their low cost, easy application and good performance. This control unit has a special application to Playmaster amplifiers, but can be used with any similar type with equal success.

AMPLIFIER enthusiasts who already have some equipment are beginning to ask the inevitable question: How can I use my present amplifier for stereo?

There isn't any one answer which will completely satisfy such a blanket requirement, but it is possible to suggest ways and means by which it can be done, and to gain some idea of the problems involved.

If we take the Playmaster range of amplifiers, for instance, some kind of a pattern emerges which can be applied to the subject in general, although it may not be possible to consider interchangeability of units among commercial designs as successfully as may be done with the Playmasters.

INTERCHANGEABILITY

This range of amplifiers, control units and tuners was arranged with such interchangeability specifically in mind, but for monaural records.

The same principles can be applied to stereo, and when more essential equipment becomes available we will attack the problem from this angle.

The Playmasters were a series of basic amplifiers, all having power sensitivities of a comparable order. Some gave their full output with 350 millivolts input and some with as low as 200.

A variation of this order is not too much to be made up by means of a balance control on a stereo pre-amplifier.

If you already have, say, a 10-watt Playmaster, and its full output is obtained with 250 millivolts, it would balance up with a second one which you may build or otherwise acquire having comparable performance.

If you wish to use a 5-watt amplifier which also gives full output with 250 millivolts, it would be suitable to work with the 10-watt job, but the latter must not be supplied with more than the 180 millivolts which it requires to give 5 watts to match the smaller amplifier.

As mentioned, this adjustment could be made with the balance control which can easily make up a difference of this nature. But the ideal would be to have two amplifiers which give the same output for the same amount of input, something which can often be arranged by slightly altering feedback factors, for instance, to increase sensitivity in the one case, or reduce it in another.

The prime purpose of the balance control is to equalise the input sections although its effect is felt through each channel as a whole.

Having arranged for two amplifiers, our next step is the design of a control unit, which is the prime concern of this article.

The specifications here do not greatly from those for a single cha except that we must arrange for tw everything, and the controls mus ganged together so that they kee step.

Once the balancing control is this synchronism depends upon accuracy of the components used.

If we think of control units su the No. 4, which used a single 12 or the No. 6, which used a pa EF86s, together with their swit systems, we will see very quickly the finished job will not be although virtually all the problem be mechanical.

A SIMPLE UNIT

There isn't any easy way out o and when high quality low output ups become available, we will ha tackle it as best we can.

But for crystal pick-ups whic becoming more easily obtainable a goes on, we can simplify things a deal, largely because the require for such a pick-up circuit can be quite simple.

Until full details of such pi become generally available, to with frequency test records to cross with them, their behaviour is lar matter of estimation and exper These have shown that, with the r so far to hand, amplifiers with a tivity of about 250 millivolts wi ample output with the pick-up nected directly to them.

If the correct loading is used t vide the nearest possible compe for the RIAA curve, such amplifier well.

There is, however, more to b sidered than this. The fitting of controls introduces an immediat culty, for these must be gange undoubtedly there will be times some tone controls will be desirable.

Therefore we must begin to about a control unit with two and output channels, which will for ganged volume, bass and treb trols, but which need not give a of itself.

The unit should also provide a for a radio tuner, so that its us

npare with that of the monaural
.
circuit and unit shown here is
lt of a first attempt to solve the
, and it might prove to be as
any, even when further experi-
available.
is have a look at it in greater

election of the valve was dictated
by gain requirements. For sim-
sake the tone controls are of the
or divider type, and the voltage
which is a feature of this arrange-
lls for an initial over-all drop of
10 times at 1 Kc.
e is a further drop in the input
of about 1.6, a total of about 16

12AU7 valve used as a resistance
amplifier gives a gain of about
s, so that there is actually a loss
through the unit.

TOTAL OUTPUT

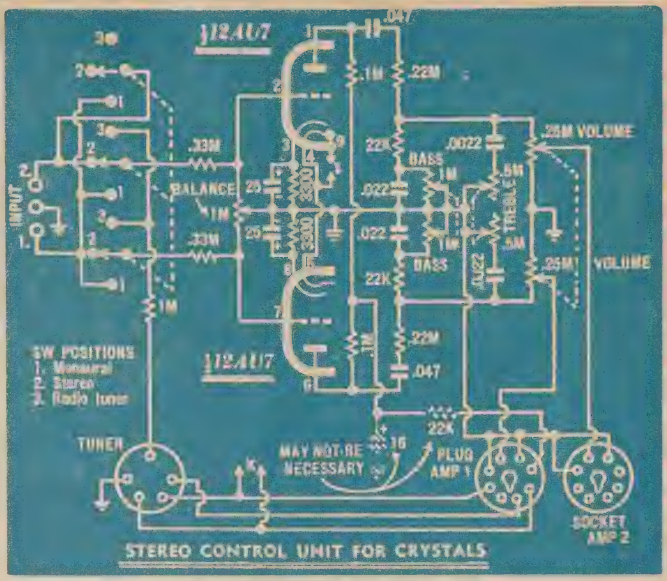
don't forget that we have been
all the time on the basis that
livolts will give full output from
lifiers. As the two most popular
e 10-watt and 17-watt amplifiers,
uld mean a total of 20 and 34
espectively available with this
f input.
ordinary room just couldn't stand
h power.
scale down our requirements to
able level, therefore, which might
1 watt and considerably more
ks, we will realise that, to gain
ount, our voltage input require-
vill be far below 250 millivolts.
we have two speakers and
rs operating instead of one, we
overwhelmed with sound unless
it to each is reduced accordingly.
experiments have been carried out
veral Playmaster types, adjusted
same power gain, all in the
17 watt class. In all cases the
e output was far more than could
l, and this should be true even
-watt amplifiers of comparable
ensitivity.
the types of stereo crystals avail-
in sight you need have no doubts
score of gain.

NCE CIRCUIT

palance circuit is similar to that
our stereo amplifier of recent
If this is centred, the total
e across the pick-up should be
ess than optimum for any type,
heans that the bass response will
what reduced. This is deliberate.
n the bass boost control is in
" position, this degree of bass
n can be considered as a slight
, and we can arrange for all bass
n to be accomplished with a
nob.
fortunate that we can manage
e 12AU7, for the drop in top
at 10 Kc through Miller effect
very great. With the 12AX7,
other hand, it would be sub-

ave used separate bias resistors
asses for the cathodes as a pre-
against cross-talk between the
. It is probable that it would
a worry, and there is no reason
shouldn't use a common circuit
xperiment. Plate and cathode
have been worked out for an
oltage of 200, and to suit the

CIRCUIT OF NEW CONTROL UNIT



The circuit is essentially very simple, though provision for stereo makes two of everything necessary. The input balance control will accommodate a fair order of difference in gain of the following amplifiers, though their power sensitivity should ideally be of similar order.

following effective grid impedance, but these should be suitable for any voltage between 150 and 300.

Maximum voltage output from the 12AU7 should be about 35 volts, which, divided by 10, gives 3.5 volts at 1 Kc from the unit. As our peak requirements for full output will only be about .25 volts, distortion at working levels should be very low.

The bass boost circuit is made up of the .22 and .022 meg resistors, together with the .022 mfd capacitor. This capacitor has a variable resistor wired across it which, in the bass "off," is shorted out of circuit. The published curve shows the behaviour of the boost, which has a maximum point at 50 cycles of about 12 db. The cut referred to earlier does not show in this curve, as it is "built in" by the value of the pick-up load resistor.

The top cut is of the simplest variety —merely a selected capacitor and variable resistor to roll off about 11 db at 10 kc.

In practice the crystal pickups sound quite good in the flat position. The bass boost is useful mainly at low volume levels, as acoustic feedback seems more of a danger than with high-grade magnetic monaural pickups.

The top cut control is probably more valuable, as even the best of crystals will exhibit peaks, and frequently they sound better with some high frequency reduction.

VOLUME CONTROLS

These two simple controls are really all one requires for listening of this type.

The volume controls are in the output circuit of the unit and feed directly into the first valves of the amplifier. Miller effect must again be watched, but in practice its effect is not great.

In many of our amplifiers the first

PARTS LIST

1 Control unit box and panel.
1 Bracket 2½ x 3 inches.
1 3 x 3 Oak switch.
1 .5 meg 2-gang potentiometer.
1 .1 meg 2-gang potentiometer.
1 .25 meg 2-gang potentiometer.
1 1 meg potentiometer.
1 Noval socket.
1 Octal socket.
1 Octal plug.
1 5 pin socket.
1 12AU7 valve.

RESISTORS

1 1 meg ½ watt (optional).
2 .33 meg ½ watt.
2 .22 meg ½ watt.
2 .1 meg ½ watt.
2 22K ohms ½ watt.
1 22K ohms ½ watt. (optional)
2 3300 ohms ½ watt.

CAPACITORS

1 16 mfd 350 volt electrolytic. (optional)
2 25 mfd 12 volt electrolytics.
2 .047 mfd 400 volt paper.
2 .022 mfd 200 volt paper.
2 .0022 mfd 200 volt paper.

SUNDRIES

1 bezel and lamp holder, 4 knobs, 2 3-lug tag strips, 3 terminals, materials for interconnecting cables (2 plugs to suit amplifiers, 1 octal plug, 1 octal socket to suit control unit, required length of cable) hookup wire, tinned copper wire, spaghetti sleeving, nuts and bolts, solder lugs, solder, scrap metal for balance potentiometer bracket.

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TYPE **HFR** MINIATURE LOW POWER

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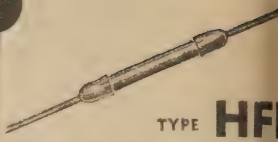
TYPE	Power Rating	Peak Voltage Rating	Minimum Available Resistance at 20% Tolerance	Maximum Available Resistance at 20% Tolerance	Dimensions	
					Ceramic Length	Resistor Body Diameter
MPF	2 watts	500	20 ohms	1.5 megohms	1·3/4"	5/16"
MPG	4 watts	500	20 ohms	1.5 megohms	2"	9/16"
MPJ	5 watts	1000	35 ohms	3.0 megohms	3"	9/16"
MPP	10 watts	1750	25 ohms	2.5 megohms	4·1/2"	3/4"
MPA	20 watts	2750	35 ohms	4.0 megohms	6·1/2"	1·1/8"
MPO	30 watts	4750	50 ohms	5.0 megohms	10·1/2"	1·1/8"
MPR	90 watts	8500	60 ohms	6.0 megohms	18·1/2"	2"

Available with Lug Terminals and range of Ferrules.



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MINIATURE LOW POWE

1. New and improved type end caps ed under pressure.
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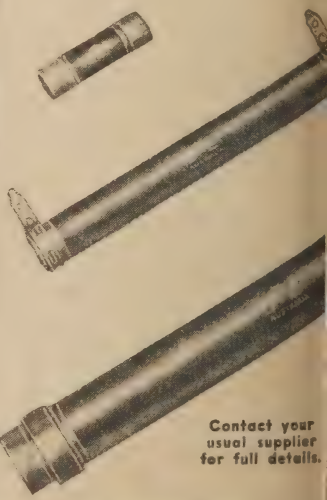
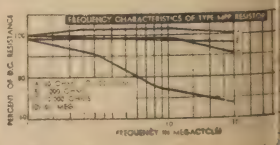
RESISTANCE VALUES: 30 ohms to megohms. **TOLERANCE:** Standard ±20 Special ±10%. 5% not available. **POW RATING:** ¼ watt at 40°C. ambie temperature. **MAXIMUM VOLTA RATING:** 200 volts peak. **CAPACI BETWEEN TERMINALS:** 0.015 Mic microfarads. **TEMPERATURE COEFF CIENT OF RESISTANCE:** Appro —0.04% per degree over temperatu range of —55°C. to +80°C.

TYPE **MP**

MEDIUM & HIGH POWER



Contact your usual supplier for full details.



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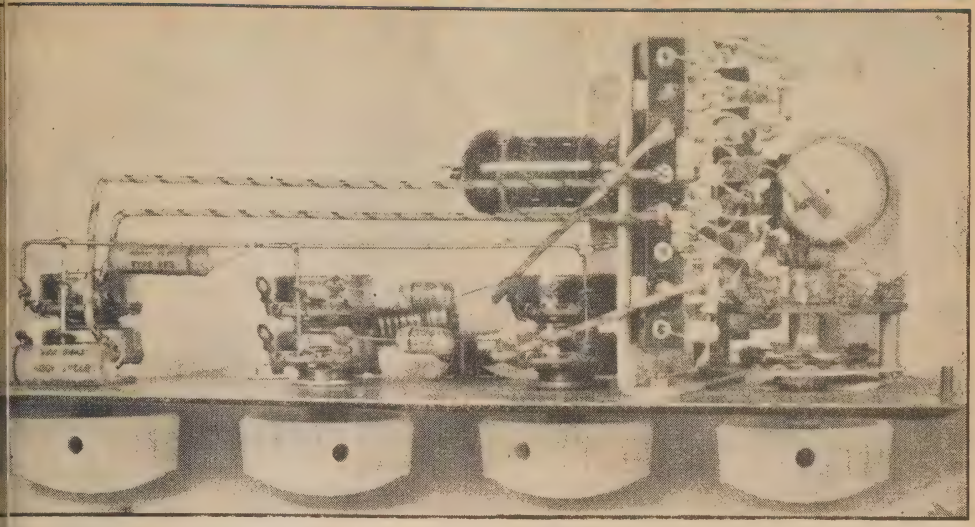


order of the controls can be ascertained from the picture on page 48. The valve and its supply components are mounted the angle bracket and tagstrips, while the balance pot. is on a separate bracket and adjustable through the top of the case.

a triode which is to some degree ble to Miller effects.
because we have kept the control .25 megs, the maximum effective rid resistance is only one-fourth ue and the loss is slight.
final source of high frequency in the coupling cable. If co-ax. microphone cable is used here, more than about 3ft of it, the very slight.
overall loss at 10 kc due to he factors would only be about

high-tension connection will de- on the type of amplifiers used. dotted components are included, least 16 mfds used to decouple, ubles should be nil as the com- input sensitivity of the unit is h. The total resistance in circuit not reduce the applied voltage han about 200 volts for prefer- although the only appreciable ce of lower volts would be to the obtainable peak output from e, already more than adequate.

R REQUIREMENTS

suggested amplifier socket con- show that power is taken from e amplifier for obvious reasons, nd requiring only an input lead. at an octal socket allows an e pin on each side of the pin the signal as a precaution against ltages being picked up at this

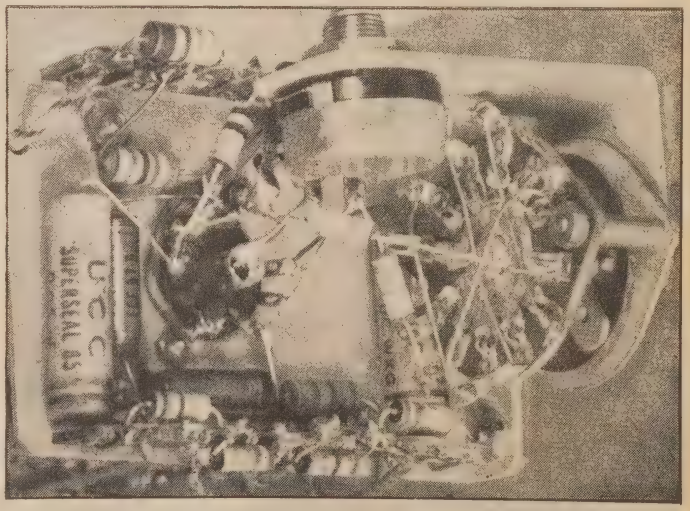
h. two amplifiers are used in this is virtually impossible to avoid ah loop if both have individual ads through a three-pin connector. t have a common earth between inputs at the control unit, and a l hum may result unless one of plifiers is not earthed via the cord.
h the whole set-up is connected, ue, the second amplifier is earthed g the control unit itself, and if you trace through the circuit this point will be clear. Thus there should be no safety risk by omitting one of the primary earth connections.

Ganged potentiometers as used in this unit are obtainable in several brands, and they are gradually becoming easier to get as standard items. Two manufacturers at least have said they will be able to supply on a fairly good basis by the time this article appears, and in the values we have shown. Some makers can supply special units which match up in resistance versus rotation by less than 2 db over the full range, and these would be preferred. It is a good thing to keep the general channel balance as accurate as possible from all points of view.

The amount of bass boost and treble cut can be varied quite simply with this circuit.

If more bass boost is required, and it might be according to taste, it can be obtained by reducing the .022 meg. resistor in the bottom end of the voltage divider circuit to .015 or even .01 megs. This will reduce the sensitivity of the unit over-all, but it should still be sufficient.

Altering the value of the capacitor in this part of the circuit will not increase the amount of boost at 50 cycles although it will bring the boost in at a



A close-up of the wiring to the valve socket, function switch and balance potentiometer.

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Frequency Response = 60-6,500 c.p.s.
Output Level = -43 (db(0 db = 1 volt/dyne/cm2)
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- Good high frequency response er excellent speech reproduction.
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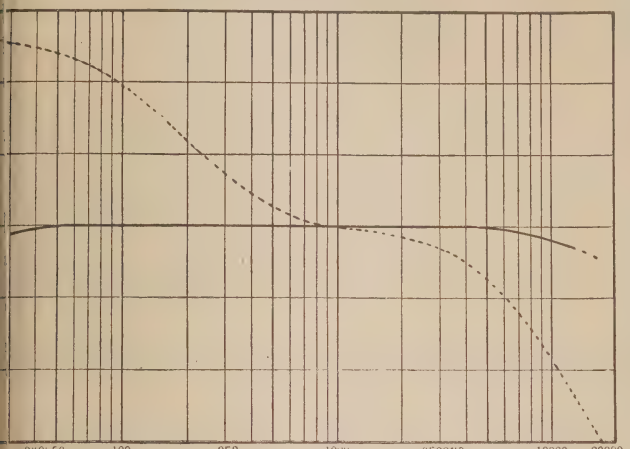
frequency and allow it to reach um value above 50 cycles. If this is pleasant there is no harm in

ther method of bringing up the ould be to increase the value of meg. resistors in series with the eads as high as 1 meg. This will educe the total unit sensitivity, t unduly. The pick-up will give ass when fed into a load of this and in fact it would be about the

Actually it is hard to nominate a value at this spot, particularly as, in many cases, a voltage divider is included at the output of the tuner itself.

If this is done in your tuner, you probably won't require a resistor such as the 1 meg. shown at all, the output from the tuner being connected directly into the control unit.

It is better to place the attenuation circuit in the tuner rather than in the control unit in the interests of play-



d curve shows the order of the bass boost and treble cut available with the ols in their extreme positions and with the component values as shown. Facil- ties for treble boost and bass cut are scarcely warranted in a simple unit.

mended value for nominally flat e. If the effect of bass cut pre- mentioned isn't important to you, thod of lifting bass is as good

ore top cut is wanted, the value top cut capacitor can be in- to any value. By doing so the commence earlier and continue increasing severity over the full e.

e is no need to alter the value variable controls.

ave shown the tuner connected meg. resistor which, together e resistors already in the input forms a voltage divider to avoid too many signal volts to the grid valve.

through reduction.

There is always the danger that a lead carrying comparatively high audio voltage will feed enough signal into the unit to leak through in the pick-up position.

It's a good idea therefore to bring only as much audio voltage into the box as is required for full radio volume. And when arranging the leads inside the box, keep this one away from the leads connecting to the pick-up.

Thus the inclusion of the 1 meg. resistor is primarily to indicate where it should be placed if required.

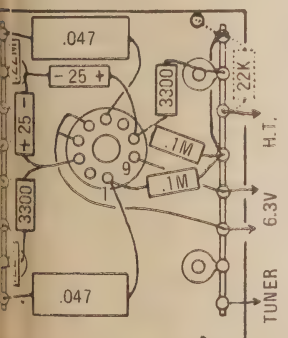
As with all the control units, the filament circuit is not earthed to the box or panel, but only in the amplifier which feeds it.

PLAIN LEADS

There is no need to shield the input or output leads inside the box, but do not twist them together or allow them to couple so that leakage between them is possible. Keep them as short as you can and do not allow them to bunch up together inside the box.

There is little difficulty in constructing the unit. As with the earlier control units we have used a small bracket to mount the valve socket, and a couple of tag strips bolted to it provide connecting points for most of the small parts.

We used one of the standard control boxes available from many dealers. One extra valve socket hole in the back of the box cover for the second amplifier output socket will be needed, and mounting holes for pick-up terminals. Some kind of shielded input plug and socket would be even better, as it is always good to avoid unshielded leads with crystal pick-ups.



ing details for the valve socket and gnips. Compare this with the otograph on the previous page.

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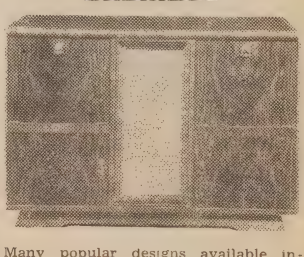

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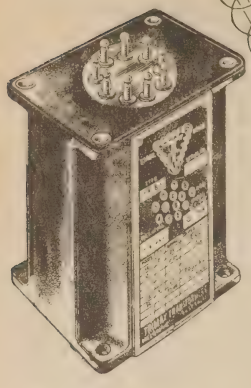

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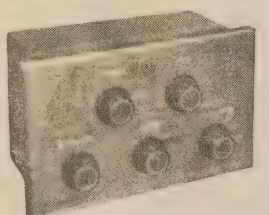

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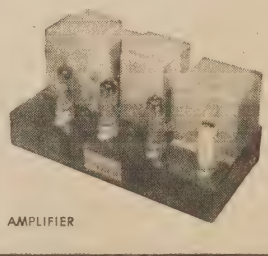

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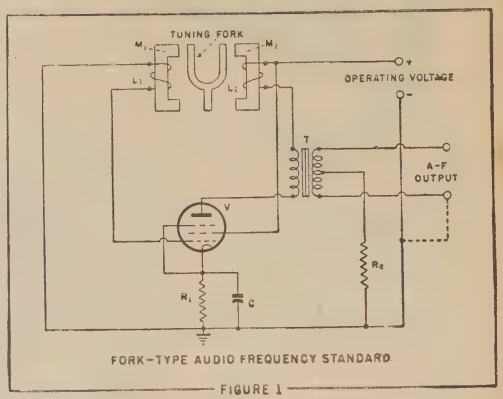
AUDIO FREQUENCY STANDARDS

his two-part article, reproduced by courtesy of Aerovox Corporation, the writer discusses, first all, the types of frequency standards which are monly used at audio frequencies. Part two, to ow, outlines methods by which unknown fre- ncies can be compared with standard signals.



FORK-TYPE AUDIO FREQUENCY STANDARD.

FIGURE 1

☆

PART ONE

☆

REAT deal of space has been de- oted in the engineering literature ecision measurement of radio fre- ies. This is true also in semi-tech- literature. Even the neophyte soon es conversant with such topics as ncy standards, frequency meters, rd-frequency broadcasts, and at and interpolation methods.

picture seems somewhat different spect to audio frequencies. Some s have a vague impression that frequencies somehow are gener- ith such precision and remain so that they seldom need measure- or that precision is not needed in spectrum.

TY OF CASES

le the latter may be true in some ies such as the generation of sim- e signals, there are countless in- in which audio frequencies must wn and maintained with high ac- The success of many electrical rements performed with an AF signal depends upon close know- eof the frequency.

e radio frequency standards seem enuch more generally familiar than for audio frequencies, it is well point to examine the configura- d characteristics of several audio ncy standards.

ral types of instruments are avail- audio frequency standards. As e of radio frequency standards, instruments provide different de- of accuracy, and the selection s upon individual demands.

ke most radio frequency stand- he demand for purity of wave- generally is greater in audio fre- standards. The chief reason for that fundamental audio frequen- ually are employed in standardisa- while a radio frequency standard ed upon to supply a great num- harmonics.

R. TYPE STANDARDS

Fork-Type Standard is an electro- nical instrument having as its basis ning fork. The frequency is gov- by the physical dimensions of the and the frequency stability with to temperature depends upon the erature coefficient of the metal from the fork is made. Stability is ed by operating the fork inside a ant-temperature oven.

tuning fork is employed as the ncy - determining element of an nic oscillator. Figure 1 shows a circuit. Here, the tuning fork precisely to vibrate at a specified ncy is mounted rigidly between agnet pole pieces, M1 and M2. h pole piece is surrounded by a inding (L1 and L2 respectively). Coil L1 is connected in the grid circuit of Vacuum Tube V, and Coil L2 in the plate circuit. Since these coils are phased for positive feedback, a simple tickler-type oscillator circuit is produced. This circuit maintains the fork in vibration at its natural frequency.

AUDIO OUTPUT

Audio-frequency output is taken from the plate circuit through the coupling transformer, T.

Supply voltages to the oscillator are regulated. Particular care is taken to minimise power supply hum in the system. The feedback level is set, by properly proportioning the inductance ration of L1 and L2 and the coupling in the feedback loop, to minimise distortion.

The entire oscillator, or at least the fork and magnet assembly, is placed within a constant-temperature oven. These measures maintain purity of waveform and minimise frequency drift.

Commercial, vacuum-tube driven forks similar to this arrangement usually are supplied for 400-, 500-, or 1000-cycle operation but other frequencies are available. Depending upon type and model, accuracy of the order of 0.05 per cent is obtainable at room temperature (25 degrees C), and up to 0.001 per cent or better with close temperature control.

Thus, frequency is maintained as closely as 1 part in 10,000 without temperature control, and 1 part in 100,000 with temperature control.

In a typical oven-controlled model, the temperature co-efficient of frequency is -0.008 per cent per deg. F, and the frequency is independent of output loading. Depending upon model, the output power into a matched load varies from approximately 1.5 to 50 milli-watts.

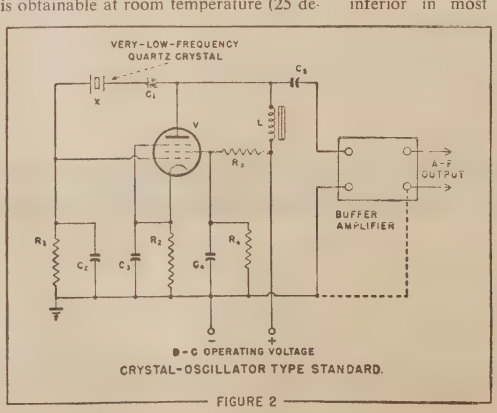
Fork-type frequency standards are provided for both battery and AC power line operation and in transistorised as well as tube types.

REED TYPE

The Reed-Type is a similar system but the tuning fork is replaced with a ferrous-metal reed which virbates between the pole pieces. The natural frequency of the reed is dependent upon the length, width, and thickness of the latter and to some extent upon the metal used.

A number of single audio frequencies are provided by commercial oscillators of various types.

The reed-type oscillator is somewhat inferior in most specifications to the fork. However, when temperature controlled and operated from a voltage-regulated DC power supply, it is satisfactory for use as an audio frequency standard in applications which do not require the high accuracy of the fork.



CRYSTAL-OSCILLATOR TYPE STANDARD.

FIGURE 2

While not so generally known, quartz crystals are commercially available at low frequencies. One manufacturer, for example, offers mounted crystals for frequencies as low as 3,000 cycles per

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• SPRING MOUNTED

The spring mounting of the Record Changer Unit Plate has been designed to ensure that the unit remains level, whatever the number or weight of records being played. Two holes are provided for screws to hold the unit for safe transit. These screws should be removed before the changer is used.

• FREEDOM FROM STALLING

The simplicity of this machine and the patented cam design are both responsible for the elimination of all heavy frictional loads and safely permit the use of a low wattage motor which is comparable with transcription practice.

• MANUAL PLAY

A single record may be played by using the manual control, the pick-up being placed on the record in any desired position. After playing a record in this manner the machine automatically returns the pick-up to its rest and switches off.

• RELIABILITY

This record changer requires a minimum of service, and adjustment should not be necessary. It is recommended that if adjustments are required, due to mishandling or accidental damage, the record changer be returned to your usual retailer or direct to the manufacturer.

• COLOURS

The changer is supplied in any of four colour schemes: All cream finish with maroon turntable mat OR all maroon finish with gold unit plate and turntable rim OR all maroon finish with cream unit plate and turntable rim OR all brown finish with mushroom unit plate and turntable rim. This changer is supplied complete with disc type operating instruction card firmly attached to the spindle.

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10- and 20-kc types are available many models. When these crystre temperature-controlled by ens in constant-temperature ovens, ability and accuracy are obtained. techniques of using a quartz to control the frequency of an oscillator are similar to the comnethods of crystal-controlling a requency oscillator. Some diffiis to be expected, however, in ing highest operating efficiency nventional grid — or plate-tuned because of the reduced possibilobtaining high-Q inductors at requencies.

simplest application would be the d" Pierce-type oscillator, such as in Figure 2. Here, the oscillator ncy is set by the very-low-frecrystal, X connected directly bethe plate and grid of Pentode Tube e blocking capacitor, C1 may be

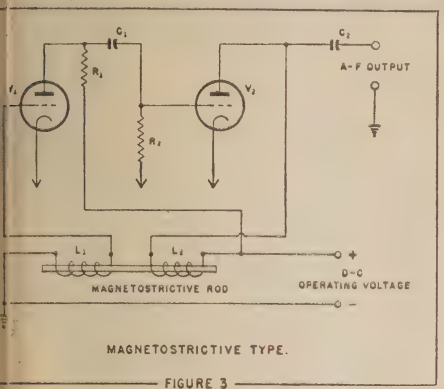

FIGURE 3

id to protect a particular crystal C polarisation.

oscillator is followed with a mplifier, comprised by one or two stages, to isolate the Pierce cirm output-load variations.

frequency crystals are, in general, ive than the more conventional bes. Their vibration amplitude must be kept lower than that RF types, in order to prevent e. For this reason, the DC plate en voltages of the oscillator tube are lower than conventional.

HIGH STABILITY

temperature coefficient of fre- of the very-low-frequency quartz a varies with type and model but of the order of 30 parts per per degree C. Thus, at audio cies, high stability is to be exwhen the crystal temperature is ntrolled.

ough the magnetostriction oscilnot widely used in the United nor readily available commerits use as an audio frequency standerits review

control element in this type of or is a nickel-alloy rod. Certain alloys have the property of magstriction: that is, longitudinal vibrahen exposed to an alternating ic field. A magnetically polarised this kind will vibrate at a fre- of an applied field.

natural frequency of the magetoti- rod is v/21, where v is the ct of sound in the rod and l the f the rod.

Figure 3 shows one type of circuit in which a magetostrictive rod (supported at its centre) is used to control the frequency of oscillation. In principle, this circuit is seen to resemble Figure 1 with the rod replacing the fork. Positive feedback is supplied by inductive coupling through the frequency-control circuit comprised by Grid Coil L1, Plate Coil L2, and the rod.

Audio-frequency output, transmitted through Capacitor C2, usually is presented to the high-impedance input of a buffer - amplifier stage inserted to isolate the oscillator from the effects of load variations.

In the absence of temperature control, conventional magnetostriction oscillators operating at 1,000 cps or higher provide frequency stability of the order of three parts per million per degree C. Close oven control of the temperature of the rod and feedback coils improves this stability.

The conventional magetostriction oscillator is somewhat bulkier in size than comparable fork reed, or crystal-controlled oscillators.

The Crystal Oscillator-Multivibrator Type frequency standard employed for RF standardisation can supply highly precise audio frequencies as well. Both primary and secondary radio frequency standards are adaptable to this service. The accuracy of laboratory-type primary and secondary frequency standards (such as General Radio Types 1,100-AP and 1,100-AQ, respectively) is 0.5 part in 100 million per year.

Frequency stability during short intervals, such as during measurement periods, is such that frequency fluctuations are less than 1 part in one billion. The high precision of the instruments is due to a combination of factors, such as low-drift quartz crystals, close control of temperature, and close regulations of operating voltages.

The precision of service-type secondary frequency standards is much lower, 5 to 50 parts per million per degree C being typical in the absence of temperature control and voltage regulation.

BASIC ARRANGEMENT

A frequency standard consists of a crystal-controlled oscillator (usually operated at 50, 100, or 1,000 kc) which, in turn, controls several lower-frequency multi-vibrators. Standard audio frequencies (such as 10 kc, 1 kc, 100 cps, 50 cps) are derived from the multivibrators and have the same accuracy as the controlling oscillator.

The oscillator is periodically standardised by setting it to zero beat with W.W.V. transmissions. If the unit is a primary standard, it may be calibrated by comparing its frequency (as referred to operation of an electric clock from one of the low-frequency multivibrators) to standard time. The waveform of the AF signal voltages is purified through the use of suitable output filters.

The block diagram in Figure 4 shows the arrangement of a frequency standard. In this setup, a precise 100 kc crystal

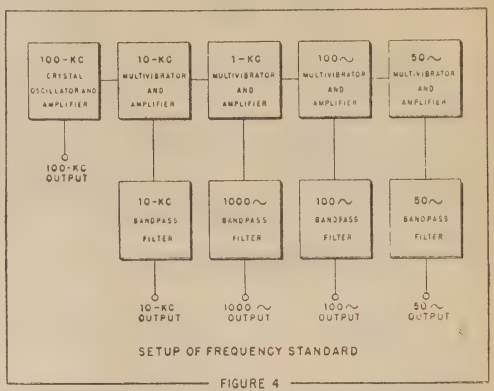

FIGURE 4

controlled oscillator is at the basis of the system. The oscillator is followed by multivibrators operated at 10, 1, 0.1, and 0.05 kc and synchronised with the oscillator. Each multivibrator and the oscillators are provided with output amplifiers for isolation.

Audio-frequency outputs are derived from the multivibrators, at 10,000, 1,000, 100, and 50 cps, respectively, through bandpass filters which purify the waveform of these signals. Other frequencies are obtainable by changing the multivibrator operating frequencies. However, the frequencies specified in Figure 4 will permit standardisation and frequency measurement throughout the audio spectrum and much of the supersonic range as well.

FROM MULTIVIBRATOR

When the waveform of the audio signal is unimportant in a particular application, AF output may be taken directly from the multivibrator stage and the corresponding bandpass filter may be dispensed with.

The standard frequency signals broadcast from stations WWV and WWVH of the National Bureau of Standards are amplitude modulated during specific intervals at 440 and 600 cps, both sinusoidal.

These two audio frequencies are highly accurate and, when obtained from a distortion-free audio channel of a non-oscillating radio receiver tuned to WWV or WWVH, may be used as audio frequency standards.

The carriers are modulated during the first four minutes of each five-minute interval, starting on the hour. During the first four-minute period, the audio frequency is 600 cps; and during the second four-minute period, it is 440 cps. The two modulation frequencies are alternated in this manner each five minutes throughout the hour.

Transmissions from WWV are on 2.5, 5, 10, 15, 20, and 25 Mc. Those from WWVH are on 5, 10, and 15 Mc.

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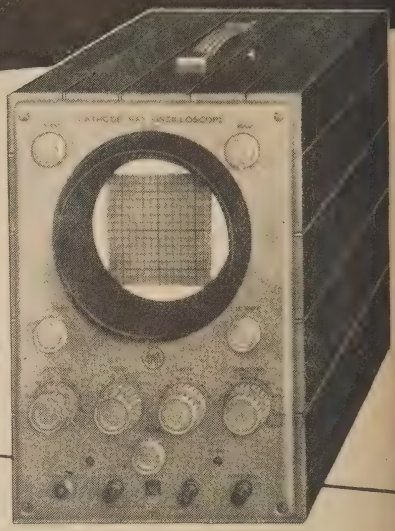

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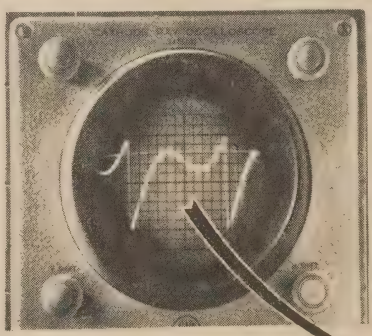
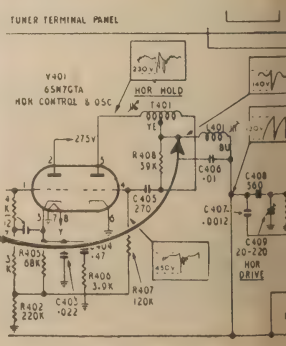


Above is an unretouched photograph of a typical wave form found in the horizontal oscillator section of a TV Receiver.

PRICE £140 (plus tax)



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Smithy's" Transmitter Now In Museum

Back in Sydney for the thirtieth anniversary of the first Pacific crossing, originla crew member and radio operator J. Warner renews acquaintance with the old one-valve transmitter.

hrough the efforts of a well-known ydney radio executive, the high freq- ncy transmitter which flew with Smithy cross the Pacific in 1928, is now housed ong with the famous Southern Cross at Brisbane's Eagle Farm Airport.

some respects, the transmitter is as historic as the "Old Bus" itself for it ided one of the first, if not the first ex- es of radio-assisted navigation on long -ocean flights.

ith its aid, radio operator J. Warner was to obtain vital "fixes" from shipping and enable navigator Harry Lyons to make all safely at Honolulu and Fiji. Without assistance, his task would have been im- urably more difficult.

HARD WAY

te the plane itself and most other things rd it, the transmitter had to be obtained hard way — by convincing somebody the flight was feasible and worthwhile and fore worthy of practical support.

riving in California in July, 1927, Kings- Smith and Ulm had plenty of ambition y the Pacific but very little money and ingly little chance of obtaining any.

owever, backed by G. A. Hancock of Los les, Sidney Meyer of Melbourne and subscriptions the people of N.S.W., they finally purchased the air- e of the Fokker monoplane, which had been used in Antarctic by Australian explorer Sir Hubert Wilkins. was fitted out with new engines and named "Southern ss."

assist the venture Messrs. Heinz and Kaufmann agreed ake up a high frequency transmitter for a more or less nominal figure. It was fitted into the plane and coupled to an aerial system on the wing.

By modern standards, the transmitter was a very elementary affair. The sole valve was a H and K 211 triode, operating in a tuned-plate tuned-grid oscillator circuit and feeding directly into the aerial.

To select operating frequencies, the operator had to change coils, made up from self-supporting metal tubing and attached to the relevant circuit elements by ordinary brass screw-type fittings.

The plate circuit was fixed tuned, the grid circuit being variable over a small range, to allow the oscillator to be adjusted for best operation.

POWER SUPPLY

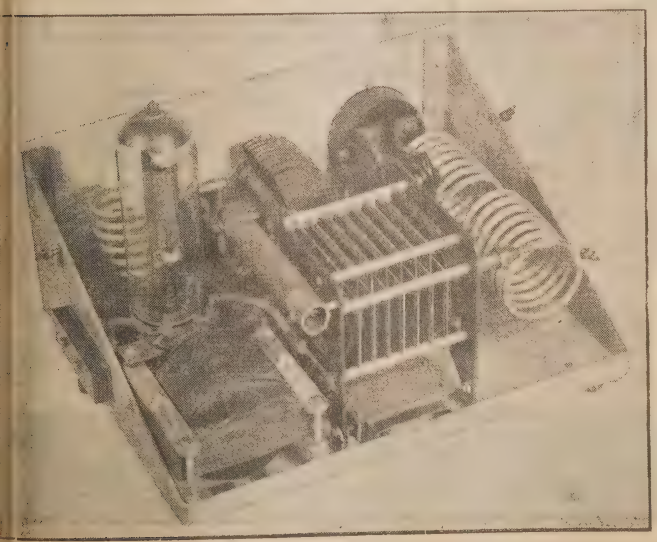
Power for the transmitter came from wind-driven alternator slung outside the fuselage. It supplied raw AC to the plate and, through a step-down transformer, to the filament.

The sending key simply broke the plate supply, the note being very rough MCW, modulated at the frequency of the alternator.

After the successful Pacific crossing, the Southern Cross made several other important flights in Australia and across the Tasman but, once again, Smithy found himself becoming financially embarrassed.

Various items were gradually remov-

(Continued on Page 127)



A rear view of the transmitter, showing the fixed tuned plate circuit to the right, with the tuneable grid circuit close behind the front panel.

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Inductance. 140 H at 10v. 50 c/s
Leakage Ind. Less than 7 m.H.
Power Response. 10w. 30-30,000 c/
Feedback phasing C required Nil.

Tested by Mullard-Australia Ltd., who say, "the power frequency response (—3db at 28 c/s) is, we feel, more than adequate for a domestic amplifier and coupled with the excellent high frequency transient performance," etc.

Watch for the Silver Grey transformer with the Black and Gold nameplate.

See your A. & R. Distributor for further details and price.

ULTRA-LINEAR

TYPE 931-15: 20 watts.
Prim.: 4500 ohms P.P.
Sec.: 3.7 or 15 ohms
Resp.: 10-60,000 cps
Valves: EL37. KT66 6L6 etc.
19% Screen Taps.

TYPE 931-8: 20 watts.
Prim.: as 931-15.
Sec.: 2 or 8 ohms
Resp.: As 931-15
Valves: As 931-15.
19% Screen Taps

TYPE 921-15: 20 watts.
Prim.: 6600 ohms P.P
Sec.: 3.7 or 15 ohms
Resp.: 10-60,000 cps
Valves: 807. KT66. etc
19% Screen Taps.

TYPE 921-8: 20 watts.
Prim.: As for 921-15
Sec.: 2 or 8 ohms.
Resp.: As 921-15.
Valves: As for 921-15
19% Screen Taps

TYPE 916-15: 12 watts
Prim.: 8500 ohms P.P.
Sec.: 3.7 or 15 ohms
Resp.: 10-50,000 cps.
Valves: 6BW6. 6V6. KT61, etc.
19% Screen Taps

TYPE 916-8: 12 watts
Prim.: As 916-15.
Sec.: 2 or 8 ohms.
Resp.: As for 916-15.
Valves: As for 916-15
19% Screen Taps

TYPE 949: 12 watts.
Prim.: 8000 ohms P.P.
Sec.: 2, 8, 12.5 and 15 ohms.
Resp.: 10-50,000 cps
Valves: 6V6. 6BW6. KT61. EL84. etc.
19% Screen Taps

HIGH FIDELITY

FOR MULLARD "5-10" AMPLIFIER

TYPE 2525 — 12 watts
Prim.: 8000 or 6000 ohms CT.
Sec.: 8; 2 or 8 ohms 15: 3.7 or 15 ohms
Response: + — 1 db 10-100,000 cps.

SPECIAL HI-FIDELITY + —. 1db 20-40,000 cps

OUTPUT TYPE

TYPE 870 — 6 watts.
Prim.: 10,000 ohms P.P
Sec.: 2 or 8 ohms.
(for "Rola" 120X)

TYPE 871 — 12 watts.
Prime.: 10,000 ohms P.P
Sec.: 2 or 8 ohms.

TYPE 872 — 12 watts.
Prim.: 10,000 ohms P.P
Sec.: 3.7 or 15 ohms.

HIGH FIDELITY + — 1db 30-15,000 cps

OUTPUT TYPE

TYPE 763 — 15 watts.
Prim.: 5000. 3000 ohms P.P.
Sec.: 15, 12.5, 8, 3.7 and 2 ohms

TYPE 920 — 15 watts.
Prim.: 5000. 3000 ohms P.P.
Sec.: 500, 250, 166, 125 and 100 ohms.

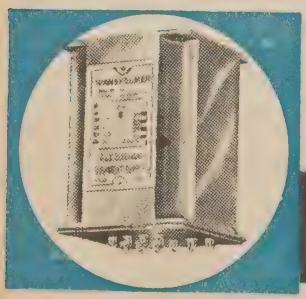
TYPE 897 — 15 watts.
Prim.: 10,000. 8000 ohms P.P.
Sec.: 500, 250, 166. 125 and 100 ohms.

TYPE 896 — 15 watts.
Prim.: 10,000. 8000 ohms P.P.
Sec.: 15, 12.5, 8, 3.7 and 2 ohms.

MEDIUM FIDELITY + — 2db 50-12,000 cps

Type	Watts	Primary	Secondary
809	15	500 ohms	15, 12, 8, 3.7, 2 ohms
914	15	5000 4000 P.P	500, 250, 166, 125 and 100
915	15	5000. 3000 P.P	15, 12.5, 8, 3.7 and 2
917	15	10,000. 8000 P.P	500, 250, 166, 125 and 100
918	15	10,000. 8000 P.P.	15, 12.5, 8, 3.7 and 2
922	25	8000 P.P.	500, 250, 166, 125 and 100

Type	Watts	Primary	Secondary
891	35	6600 P.P	500, 250, 166, 125 100, 83 ohms
892	55	3200 P.P	500, 250, 166, 125, 83, 62 and 50
928	5	7000. 5000 S.E	12.5, 8, 3.7 and 2
929	10	4000. 2500 S.E	15, 12.5, 8, 3.7 and 2
930	10	4000. 2500 S.E.	500, 250, 125
932	7	10,000 P.P.	15, 12.5, 8, 3.7 and 2



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Victoria: Homecrafts P/L., J. H. Magrath and Co. P/L., Radio Parts P/L., Warburton Franki Motor Spares Ltd. **Sth. Aust.:** Gerard and Goodman Ltd., 196 Rundle St., Adelaide. **Qld.:** A. B. Harrold, 123 Charlotte St., Brisbane; Messrs. Chandlers P/L., Cnr. Albert and Charlotte Sts., Brisbane; Trackson Bros., 157 Elizabeth St., Brisbane. **W. Aust.:** A. J. Wyle P/L., 1064 Hay St., Perth. **Tas.:** Homecrafts P/L., 220 Elizabeth St., Hobart. **N.S.W.:** Factory Reps.: R. H. Cunningham P/L., Meadowbank; United Radio Distributors P/L., 175 Phillip St., Sydney. Homecrafts P/L., 100 Clarence St., Sydney.

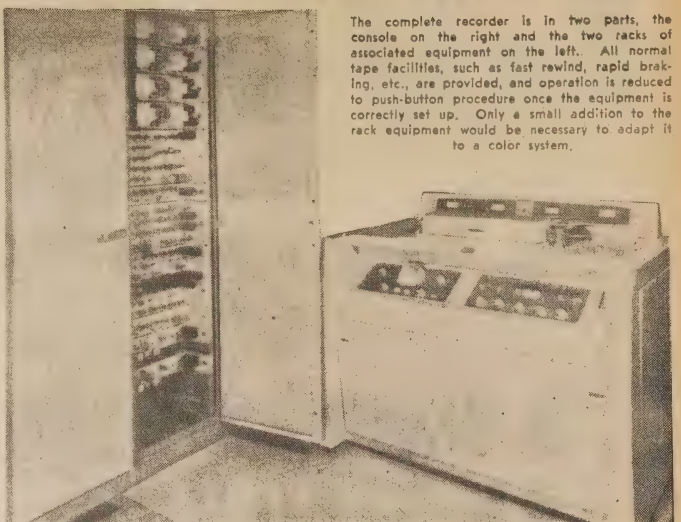
A & R ELECTRONIC EQUIPMENT CO. PTY. LTD.

378 ST. KILDA ROAD, MELBOURNE, S.C.1

Telegrams: "ARLEC," Melbourne. MX 1150, MX 1159

TN USING VIDEO TAPE RECORDER

, PHILIP WATSON



The complete recorder is in two parts, the console on the right and the two racks of associated equipment on the left. All normal tape facilities, such as fast rewind, rapid braking, etc., are provided, and operation is reduced to push-button procedure once the equipment is correctly set up. Only a small addition to the rack equipment would be necessary to adapt it to a color system.

le practice of recording TV material on tape rather than film is well established overseas, th a variety of approaches to the difficult task of recording the necessary bandwidth. Now le process comes to this country, the first video tape recorder in Australia having been recently put into operation by ATN, Channel 7, Sydney.

: ability to record TV programs is ital to the success of any TV sys- The cost of producing most pro- is so high that it is normally im- le for any one station to recoup ost, even assuming a high popula- density and a high percentage of rs.

ans must therefore be provided to such programs to be released h a number of outlets, so that sections of the community can bute to the original cost. In this he large station is able to justify st of expensive programs, while r stations—which could never hope tiate such programs themselves — le to present top quality shows at onable cost.

RIBUTION LINKS

re are many ways in which pro- may be distributed. Where the t matter is topical and of national tance the micro-wave link or co- cable—yet to be established per- tly in this country—is probably

st, but may be very costly. Once a large number of viewers are ed to justify it.

alternative — particularly where ne factor is less important, as in se of pure entertainment material than actuality broadcasts—is to the program and distribute it as ed.

V TAPE

n has been the most popular m for this in the past and, in spite rtain inherent disadvantages, will bly continue in this role for a long ro come. Ease of duplication and n, compact storage, and universal bility of replay facilities are some e most powerful factors in its r.

wertheless, film has its limitations. t used in the most convenient man simply record the image as pre- t on a monitor screen (variously n as a "kinescope," "telerecording," t can never produce anything like ality of the original image.

the worst case it will only record the number of lines used in the n (i.e. something less than 300 lines ustralian standards) due to the time ed to "pull down" each frame. is arranged to occur during one half e interlaced field. When such an a is scanned again in what must be tely random fashion the loss of ly is considerable.

Vire recent equipment, such as the oni fast pull down camera, over- s this by achieving a pull-down time urable with the blanking period. o, TV and Hobbies, March, 1958.)

Virtually the full number of lines are now recorded, giving much higher definition, even though some of this is still lost when the image has to be scanned again for re-play. One of these Marconi cameras is, in fact, used by ATN for film recordings, and most viewers will be familiar with the high quality possible, even though there is seldom any doubt that the program is a telerecording.

Another disadvantage of film is the virtual impossibility of avoiding severe gamma (contrast) distortion, and is one reason why film, whether a telerecording or not, is always recognisable as such.

In addition, there is the cost of film stock and subsequent processing, plus the fact that the quality of the film, either technically or artistically, cannot be judged until after processing—by which time it is generally too late to make corrections.

TAPE QUALITY

It is in an effort to overcome these disadvantages that engineers have been concentrating on the development of video tape recording to the point where it would not only do a better job than film, but would actually approach the quality of the original picture.

This latest addition to ATN is of special significance in this respect, since the makers, the Ampex Corp., California, consider that it achieves the highest standards of any machine they have yet produced.

Not many countries, even including those using 625 line systems, have video standards equal ot those employed in Australia, and the Ampex Corp. regarded the order to supply a recorder to ATN as something of a challenge. They had never before produced a machine capable of achieving a 5 Mc bandwidth—a figure considered necessary to do justice to the Australian standards.

They accordingly set out to see just how close they could come to these standards, and a good deal of research was devoted to the problem, while a machine was being produced to accommodate the other standards of our system.

The result is the machine now in use at ATN, and the makers are justly proud of the fact that they not only improved the performance over that of their previous machines, but have actually achieved the 5 Mc bandwidth originally suggested.

At a recent demonstration at ATN studios the writer was privileged to watch this remarkable machine in operation, and it was immediately obvious that the claims made for it were well founded. Items from a recent studio production which were replayed from it were virtually indistinguishable from original material—even to an eye well practised in the role of picking faults in TV images.

NO TONE DISTORTION

Apart from the excellent reproduction of fine detail, the point which was immediately obvious was the complete absence of gamma distortion. The long tonal range so characteristic of the best studio techniques was captured in its entirety. This fact alone would be sufficient to set the system apart from film recording.

The machine which achieves this re-

New Release

PUBLIC ADDRESS AMPLIFIERS

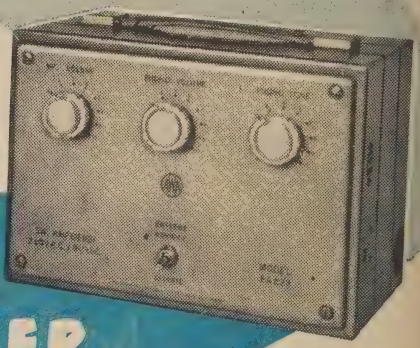
DUAL OPERATION mains or battery

The addition of two versatile mains and battery operated amplifiers to the extensive range of A.W.A. sound equipment provides for every requirement of mobile Public Address Operators.

Type PA828 amplifiers may be operated from 240 volt or 6 volt battery supply, changeover being effected by alternate cables which are stowed in rear of housing. A standby switch is provided to conserve battery life.

5 WATT AMPLIFIER

TYPE PA 828



20 WATT AMPLIFIER

TYPE PA 829

Type PA829 20 watt mains or 12 volt b
tery amplifier provides all facilities necess
for P.A. Hiring.

These include two microphone chan els w
third optional channel for microphone
pickup. Either high or low output pickups
be used. Features include a battery sav
switch and a bass cut switch to control
response when using horn speakers. A plu
V.U. meter and monitor speaker with th
associated switches are ancillary units.

FOREMOST IN SOUND

AMALGAMATED WIRELESS (AUSTRALASIA) LIMITE

47 YORK STREET, SYDNEY, B0233. 167 QUEEN STREET, MELBOURNE, MU91

Available in other States from

NEWTON McLAREN LTD., ADELAIDE NOYES BROS. (MELBOURNE) LTD., HOBART AND LAUNCESTON
CHANDLERS PTY. LTD., BRISBANE NICHOLSONS LTD. PERTH.
ALSO FROM LEADING WHOLESALERS.

le performance is extremely in-. (Radio TV and Hobbies, Octo-957.) Although the tape travels / 15 inches per second, a high e recording speed is achieved by ng across the tape rather than t. The tape is 2in wide and four ecording heads are employed; be- at 90 degrees to each other on mbly which rotates them across e at high speed. The head assem- ually rotates at 15,000 r.p.m.

M DETAILS

transverse line contains 20 lines ure information. It is 10 mils ndths of an inch) wide, and there roximately 5 mils of "land" be- tracks. As well as the video in- on, there are two additional re- s, each along one edge of the One is the accompanying sound, other a synchronising track used the heads accurately aligned with ks during playback.

an be appreciated, the fact that t tracks contain information 20 part makes it essential that each eplays only one line at a time. ift such as might allow part of acks to be played simultaneously cause severe picture distortion.

ng recording, the rotating head is driven from a 250 cps signal from the 50 cps frame pulse or, via a frequency multiplier. The pstan is also driven from a 250 ply, but this time derived from a ell which picks up a pattern on part of the revolving head ism. This 250 cps signal is also e recorded on the edge of the

ng playback, the head motor is from the frame pulse generator re, while the capstan is fed from ridge oscillator designed to de- nominal 50 cps. The actual fre- at any instant is determined by ol voltage generated by compar- phase of the 250 cps output from oto-cell with the 250 cps output e control track.

is way absolute synchronism be- head and tape movement is as- regardless of the many variables, g tape stretch, likely to affect it. ires approximately four seconds system to adjust itself after start- but, once in step, it will remain finitely.

UENCY MODULATION

use of the extremely wide band required, as distinct from the high limit, it is not feasible to record eo information directly as such. , it is used to frequency modu- 5 Mc carrier, the frequency devia- ing approximately 1 Mc. This al- response from DC through to 5 be obtained. Although some of ndamental requirements of FM s are transgressed by these figures, ults, particularly in terms of noise re still adequate for the purpose.

the sound and synchonising are recorded after the video has ade, the appropriate heads being inches away. Since the video in- on extends right across the tape, w track is erased to provide room new track.

does not interfere with the video ng because it is arranged that this s always occupied by a blanking period, so that no vital information is lost.

The tape used is extremely thin, measuring only 1.5 mils over both base and coating. Yet it is extremely strong, a fact which one of the ATN engineers and the Ampex representative demonstrated by staging an impromtu tug-o-war with a discarded portion of it. A 12in diameter reel will record over 60 minutes of program. Quite naturally, the coating on the tape is the highest quality it is possible to produce.

The machine features fast re-wind, high speed braking etc., as found on a conventional tape machine, making it possible to re-play all or any part of the program within minutes of the recording being completed. A program which is no longer required is removed by means of a bulk eraser.

The life of the tape is approximately 100 playings, while the head assembly requires reconditioning after this period also. The main effect of worn heads or tape is an increase in noise level. Gamma range or detail are not seriously affected.

ECONOMICS

On this basis, tape recordings are not significantly cheaper than film. Their main advantages are the higher quality and immediate replay facility. At the moment, it is not even possible to use tape for program distribution to other stations, since this is the only machine in Australia. However, someone had to make the first move, and this situation is not likely to last very long.

A further feature of this recorder is that it can be readily modified — by the addition of a couple of small chassis to the main rack — for the TV colour systems at present in use or envisaged for the future. The ability to by-pass film for this operation will be even more valuable than for black and white working.

Atom sub is safe

SAILORS in an atomic submarine receive less radiation than their families at home, according to a doctor. Commander Richard Dobbins, who served in the atomic submarine Nautilus, on its voyage under the North Pole.

This was because seawater and the ship's hull screened out cosmic rays, he said.

He said there was complete medical safety serving in an atomic submarine.

Recently Denmark refused permission for the Nautilus to enter Copenhagen Harbour because of a radiation scare.

Commander Dobbins said the average crew member in one year received less than one-fiftieth of the radiation regarded as safe by the National Bureau of Standards.

"To begin with," he said, "we have an almost foolproof system of checking radiation. Each day, and several times a day, two hospital corpsmen and I go around with with portable survey instruments.

"In addition, we take samples of the atmosphere by pulling a certain amount of air through filter paper to inspect it. Also, we take smears of all surfaces—desks, table tops, galley stoves, instrument panels.

"As an added precaution all crew members wear film badges sensitive to radiation. Besides, there is an electronic monitoring system operating at all times checking unusual conditions."

NEW FIGURED FRONT PANELS

...or R. and H. designs. New R.C. Bridge Vacuum tube volt meter, multimeter sweep and marker generator. Oscilloscope, figured with all holes punched, black background, silver figures, 19/6, plus 12½ per cent tax, plus postage 1/4.

TV

Brass Tuner Chassis, R. and H. type. **19/6** plus 25% tax. 1/4 postage.

AUDIO

Lineat Output Push Pull Transformer, 20 watts full fidelity, tapped two positions, one for beam tubes, 6V6, SC7, etc. One for penthode as EL84, EL34. Uncased. Weight approx. 5½lb.

£4/5/ plus tax.

Linear single output, full fidelity, tapped. 5 watts, **£2/19/6**, plus tax.

Instrument Transformer, 240 A.C., 150V 15 mills, 4 and 6 volts, 2 amps. **£1/19/6**, plus tax.

Step down Transformer, 3 amp, 240 A.C. to 12V or 6V, **20/**, plus tax.

OSCILLOSCOPE CASES

The R. and H. type, wide band, complete set of chassis and fittings, punched ready to assemble in latest charcoal grey instrument colour with figured front panel.

£10/19/6, plus tax 12½%

The fundamental Kit, consisting of chassis and fittings with case, front panel and figured front panel.

£5/19/6, plus tax 12½%

The case only—

£5/19/6, plus tax 12½%

The R. and H. type figured front panel, **19/6** plus 12½%.

The economy kit, consisting of case and one unpunched chassis suitable for simpler type of Oscilloscope, **£4/19/6**, plus tax 12½%.

Oscilloscope, R. and H. type tube shield, 5 B.P.I.

£3/19/6, plus tax, 12½%

Standard Instrument Cases. Finish Grey.

Cat. No.	Long	High	Deep	Prices, plus 12½%	S.T.
MC6	6	6	6	11	9
MC5	9	6	5	12	10
MC7	10	8	7	17	10
MC67	12	7	6	19	9
MC81	10	10	8	1 3	6
MC811	12	11	8	1 8	3
MC82	13	8	6½	1 8	3
MC79	15	9	7	1 11	0

Sloping Front Cases

SF7	7½	6½	6	15	3
SF79	9½	6½	7½	19	6
SF71	11	6½	7½	1 2	0
SF8	13	8	8½	1 6	6
SF10	18	10	10	2 1	0

R. & H. type Cabinets, finish charcoal grey, louvred sides, welded corners. Plus tax. 12½%.

MC5A	9	6½	5½	18	9
MC82A	13	8	6½	1 12	3
MC87A	15	10	8	2 2	0

Sloping Front for Multimeter.

SF7A	7½	7½	7½	1 1	0

Mackinnon and Nicholls Ltd., 468 Collins Street, Melbourne.

R.H.Oxford&Sons

Pty. Ltd.

97 Marriott St., Redfern N.S.W. MX3764

Light and compact, our new "Transportagram" is completely self-contained, requiring neither power cord nor external aerial. Colour scheme is beige and deep wine.

A Battery-Powered Portable Radiogram

Here is a set which we feel sure a great many of our readers will welcome eagerly; a completely self-contained battery operated radiogram, using the latest transistor circuitry and battery operated turntable. Light, efficient, and cheap to run, it is an ideal entertainment unit both indoors and out.

THE idea of a compeltely battery-operated record-player is not new, and we have been toying with the idea for a long time; in fact, ever since the first transistors made possible a compact and efficient audio amplifier with a reasonable power output and high operating economy.

BATTERY TURNTABLE

The only catch was the lack of a suitable battery-operated turntable. These had been developed overseas for some time, and have appeared in local commercial units more recently, but it was only a couple of weeks ago that we were assured that adequate stocks were now available for the home constructor.

A sample supplied to us by the Goldring organisation proved to be a very efficient little unit. It uses a governor controlled, permanent magnet motor intended for six volt operation.

Current consumption is only 50mA, yet the motor has adequate power at all record speeds. All four popular speeds are provided and are quickly and easily selected. Provision is also made to release pressure on the idler pulley when not in use to prevent the formation of "flats."

by Philip Watson

With this, and the circuitry deve for the recent "Transporta Six," i peared perfectly feasible to develop just a record player, but a com radiogram. We felt that such a would have considerable appeal. entirely independent of the power it could be used out-of-doors anyw to provide radio and recorded ente ment in a manner not previously sible.

At the same time, it is not onl outdoor unit. The low operating gives it a very definite place indoo well; by the bedside, in the den or shop, in fact anywhere that a radi player may be required, but where not always convenient to plug in power point.

ELECTRICAL CIRCUIT

Electrically, the circuit is little diff from that used in the Transporta changes being the purely minor necessary to allow switching bet radio and gram, and the addition tone control to permit balanced r duction from microgroove records.

We refer readers to the August September issues for a full discussio the circuit, components and general structional details of the actual rec This article will be devoted maini a discussion of the modifications requ along with the design of the cab physical layout, etc.

However, before commencing the story, there are a few points we w like to raise concerning the Transp units, and which apply equally, wh they are to be used in the original able or the present project. These mainly concerned with component present available for this set.

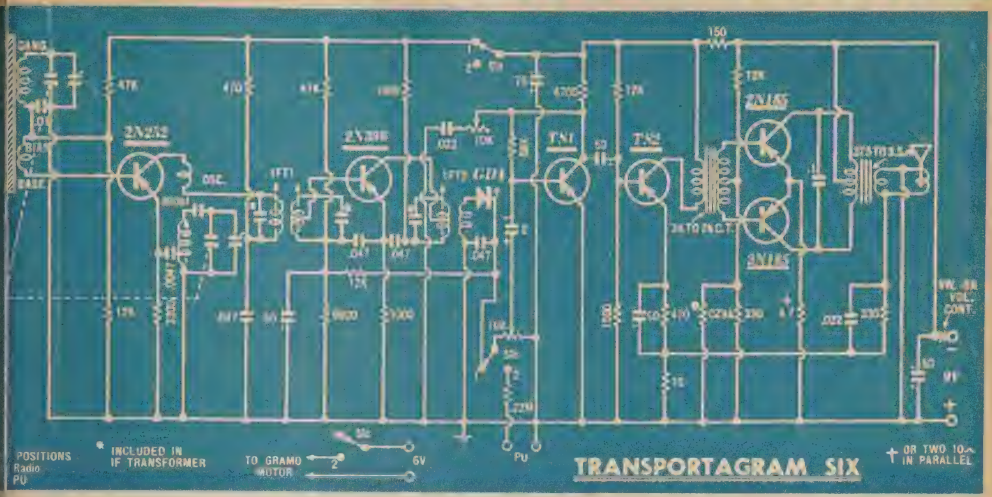
Some of these are not the sam those used and specified for the orig and we feel that prospective purch should at least be aware of the s tion, so that they may make their decision in the matter.

One set of coils on offer uses single-tuned IF's in place of the ori double-tuned 1st and single-tuned 2n We would expect the selectivity t reduced somewhat by this modifica though still ample for most purpose

Another coil variation is an aerial oscillator coil designed for use wi 300 pf tuning capacitor, in place of 415pf originally specified. There i objection to this arrangement, but important to see that the correct gang and dial are used together. O wise it will be impossible to track stations, plus the possibility that th may be able to tune down to its IF, with resultant instability.

A third variation involves the us a ferrite aerial rod with a fixed coil a shorted turn to provide adjustmen the tuning inductance. We tried arrangement ourselves in the early of ferrite rods, but subsequently disca it in case the practice should lea reduced efficiency.

"GRAM" CIRCUIT ADAPTED FROM "TRANSPORTA SIX"



The circuit is identical with the "Transporta Six" apart from the tone control and the switching to take in the pickup and render the tuner inoperative. Wiring details of the printed boards, etc., were given in the August, 1958 issue, while detailed explanation of the design appeared last month. Copies of both issues are still available.

Some audio transformers may also cause temporary confusion, since they appear to be incorrectly colour coded and, if wired to the printed boards as indicated, will result in positive rather than negative feedback around the audio system. The fault can be corrected most easily by simply transposing the feedback and earth leads to the secondary of the output transformer.

It is important that, if the system goes into audio oscillation as a result of this, the switched off immediately and the condition corrected. Continuous operation in this fashion can result in overload and damage to the transistors.

Also on the subject of feedback, one version of the circuit makes no provision for the .022 mfd phasing capacitor in parallel with the 330 ohm feedback resistor. This may not be strictly necessary in all cases for stability, depending on the design of the output transformer, but we feel it should be included anyway, as a matter of course. Its absence can cause pronounced peak at the top of the audio range.

CAPACITORS

Some readers have apparently experienced difficulty in obtaining the 75 mfd electrolytic originally specified, although these were assured at the time that ample stocks were available. However, a 50 mfd can be used in its place without any significant change in performance.

Other queries concern the use of alternative transistor types. As far as the circuit of the set is concerned, we feel that it would be very unwise to suggest any alternatives at the present time, except that the GD4 diode may be replaced by a GD3 and, in all probability, any of the other current diodes as well.

In the audio board it is possible to make some changes. In place of the TS1, TS2, and 2N185s, it is possible to substitute OC70, OC70, and OC72s respectively. An OC71 may also be substituted for the TS2, but the higher audio gain following the volume control could lead to excessive hiss level.

For the same reason, it is not desirable to use a TS2 in place of the TS1, as has been suggested by some readers.

We should also mention that some transistors likely to be available appear to be 6-volt types, although the data we have had so far is rather indefinite on this point. Until the position is clarified, it would seem safer to stick to the recommended types.

This covers all the major points which have been raised so far. It is, of course, unlikely that any one builder will encounter more than one or two of them, but it is worthwhile keeping them in mind when planning either project.

Reverting to the present design, we have to consider how to make the best possible use of the new components. Because of the compact design made possible by transistors and printed boards there is a natural temptation to make a set of this kind as small as possible, if only from a natural desire to show what can be done.

This may be justified in the case of a personal portable, but it is a very dif-

PARTS LIST

- 1 Cabinet (see text).
- 1 6-volt battery governor-type motor, 4-speed.
- 1 Crystal P.U. to suit.
- 1 Station selector knob.
- 1 Pair dual concentric knobs to match.
- 1 Brown knob.
- 1 5-7l speaker, 3.5 ohm VC, or similar.
- 1 Output transformer, 375 ohm CT to 3.5 ohm.
- 1 Driver transformer, 3,000 ohm to 2,000 ohm CT.
- 1 2-gang 415 pF tuning capacitor.
- 1 ¼in extension shaft for above.
- 2 50 pF trimmer capacitors.
- 1 Special coil kit comprising aerial rod and coil, oscillator coil, first and second IF transformers.
- 1 GD4 germanium diode (or GD3).
- 1 CZ9A thermistor.
- 1 Dual concentric miniature potentiometer with single-pole switch. 10K resistance elements, normal taper. (Low "Hop-on" resistance preferred for vol. control section).
- 1 3-pole 2-position rotary switch.

TRANSISTORS

1 2N252, 1 2N308, 1 TS1, 1 TS2, 2 2N185.

RESISTORS:—all ½ watt.

1 .22M, 1 68K, 2 47K, 4 12K, 1 6,800 ohm, 1 4,700 ohm, 1 3,300 ohm.
1 1,500 ohm, 2 1,000 ohm, 2 470 ohm, 2 330 ohm, 1 150 ohm.
1 10 ohm, 1 4.7 ohm or 2 10 ohm in parallel.

CAPACITORS

1 75 uF 12 VW electro., 4 5 uF. 12 VW electro., 1 2 uF 25 VW electro., 1 0.1 uF 100V paper, 4 0.047 or 0.05 uF 100 V disc ceramic, 2 0.022 uF 200V paper, 1 0.01 uF 100V disc ceramic, 1 0.0047 200V plastic, 1 390 pF 600V plastic.

Hook-up wire, spaghetti tubing, resin core solder, 9 volt battery (type 276-P or similar) 6 volt battery (type 509 or similar), 2 ⅜ ID rubber grommets, battery plug, wood screws, spacers, 3 lug tagstrip, expanded aluminium 9½ x 6 inches, two gang mounting rubbers.

GENERAL ACCESSORIES

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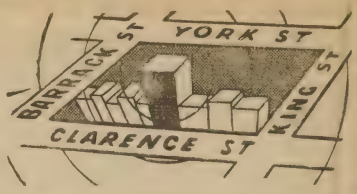
(FORMERLY HOMECRAFTS PTY. LTD.)
100 Clarence Street, Sydney
Phone BX 4451



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5FX .	£2/5/6	12-0 De Luxe	
5-7H.	£2/8/0		£6/10/0
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6H ..	£2/5/0	12UX Hi-Fi, 15 ohm V.C.,	
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Q Plus Crystal Set complete with Headphones and Aerial .. **£4/19/6**
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Single Gang Condensers ..	1 guinea
Q Plus Headphones	£2/1/-
Spring Terminals	1/2 ea.
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OA70—OA73	6/1 ea.
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Standard	£2/10/-
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Complete with wrench

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Pocket Size, Complete with printed circuit
Leather Carrying Case
Full wiring diagram.
6 Transistors.
Specker also Hearing Aid Extension.
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rent matter where a radiogram is con-erned, if the final performance is to stify its existence. In any case, the ze of the turntable and pickup, and ie size of the records to be played, are ctors we cannot ignore, and they have great deal of bearing on the final esign.

We could possibly save a little space we assumed that nothing larger than 10in record would ever be played, but e feel that this would be a very npopular restriction. A large percentage long-playing discs are 12in and, even we admit that a set of this nature is ore likely to be used for "pops" than r serious music, there are still plenty occasions when 12in discs are likely be used.

Once we accept this requirement we id ourselves committed for a size of binet which, with careful planning, can made to take one of the larger eakers. The higher efficiency of these nits is very useful where we wish to ake the best possible use of the avail-ble audio power, and this is far more kely to be the case with a radiogram an something in the personal portable ass.

ODERATE SIZE

All this adds up to a very strong case r a reasonable size cabinet which, while ll light and easy to carry, will not riously prejudice the final performance d we based our design on this idea.

It resulted in a cabinet approximately in square and 6½in deep; still an essen-lly "portable" size, yet one which al lved us to accommodate everything we nted within it. It seems a much bet-r approach than that of making every-ing "sub-miniature," merely for the se of doing so.

The actual styling also provided plenty food for thought, and readers may te our word for it that the final result s no snap decision. However, we nsider the trouble well justified, be-use the finished job looks really pro-fsional and has prompted admiring marks from all who have seen it.

Whether you build this yourself or ly it ready made will depend whether u can afford time for the former or ney for the latter. However, a ready-ide cabinet will probably be fairly stly, and the saving of making your n will be quite substantial. We have, refore, prepared a complete set of rking drawings which should contain the dimensions, etc., likely to be eded.

ILDING THE CABINET

We do not propose to go into detail the finer points of cabinet construc-tn, since this subject was covered in t beginner's article in the September ue. However, there are some special ints concerning this design which are rth considering.

Several dimensions in the drawing are rked with an asterisk, indicating that awance must be made for the thick-ns of whatever covering material is t be used. In the case of the motor ard dimensions it is necessary to allow f two layers on each side—one on t board and one on the inside of the binet—making four in all. The width is the most important dimension here. Allowance for this must also be made in fitting the cleats to support the motor board, since the covering on the latter will normally be turned over the edges and on to the underside.

Most important in this respect is the lid. This needs to be fairly accurately cut if it is to match up correctly with the main cabinet, particularly along the break at the top front. The two pieces removed from the body of the cabinet to take the lid are really too small to become part of the lid themselves, even allowing for two layers of material between them (unless it is more than average thickness) and the use of a fine hacksaw blade to minimise waste. It would appear to be much safer to cut fresh pieces, making them slightly oversize initially, and planing them down as necessary.

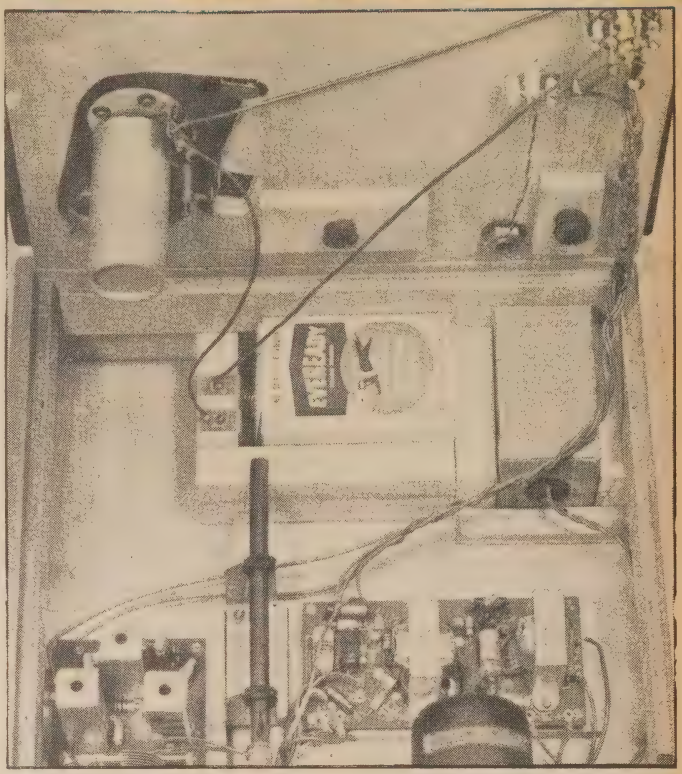
In all cases the final dimensions are best determined experimentally, using samples of the covering to provide the correct spacing. Remember that the length of the lid sides is effected as well as the height.

ROUNDED CORNERS

When all the woodwork is completed the main edges should be rounded with a wood rasp or by sanding. The amount of round provided will depend on personal taste, but a minimum at least is desirable to protect the covering from excessive wear. On the other hand, if an obviously rounded look is required, it will be found that a given curvature is normally less obvious under the covering than on the bare woodwork.

Of course, it is not essential that the cabinet be covered. If you feel that you are capable of making a good job with polish or lacquer, there is no reason why

VIEW OF WIRING INSIDE CABINET



This picture, with the motor board tilted back, shows the wiring underneath the board, the batteries and the receiver proper. No chassis is used, the printed boards carrying the audio and tuner sections being screwed to wooden blocks on the floor of the cabinet.

RESISTOR COLOUR CODE

68K	Blue	grey	orange
47K	yellow	violet	orange
12K	brown	red	orange
6,800	blue	grey	red
4,700	yellow	violet	red
3,300	orange	orange	red
1,500	brown	green	red
1,000	brown	black	red
470	yellow	violet	brown
330	orange	orange	brown
150	brown	green	brown
10	brown	black	black

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as used in the famous "Q-PLUS" 17" & 21" TV KIT SETS

For those who have many parts already, "Q-PLUS" are releasing the full range of components manufactured by them. Th you may be sure that all the important inductive components will match each other.

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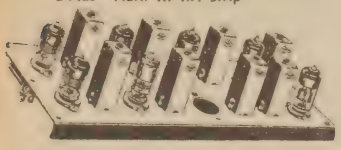

"Q-PLUS" Mark III Video and I.F Strip. Completely wired, tested, aligned and sealed with all valves (4—6CB6, 2—6AL-53, and 1—6AU6) with 1 spare 6-AL5 diode, which can be used as A.G.C clamp, etc.

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Q-Plus width, Linearity, Horizontal Blocking Osc. & Horizontal Sine Wave Coils.

Q-Plus VH01 Horizontal Blocking Osc. Coil
An unshielded line blocking Oscillator transformer recommended for "Synchro-Guide" or similar circuits (e.g. R.T. and H. 17in TV receiver, May, '57), "clip-in" mounting, base lug terminations and threaded iron core with hexagonal hole.

Q-Plus VHS2 Horizontal Sine Wave Coil
An unshielded line sine wave coil recommended for use with Type HO1 line block oscillator transformer, to improve stability of the line oscillator. Also suitable for "ringing" coil for line multivibrator circuits, features "clip-in" mounting, base lug terminations and threaded iron core with hexagonal hole.

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An unshielded line width coil recommended for the adjustment of picture width by means of a variable inductor (width coil) across a small part of the horizontal output transformer, e.g. R.T. and H. 17in. May, '57, features "clip-in" mounting, base lug terminations and Ferrite iron core

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New type construction allows very simple mounting to be used. Special Q-Plus Impregnation technique ensures full output over long periods.

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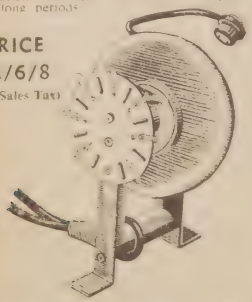

★ "Q-Plus" TV Power Transformer Type No. 4/17 .. .. £6/1/6
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★ "Q-Plus" 6 UH Choke Type VPC-6 .. .. .. 2/8
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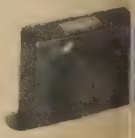

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SYDNEY: 8 Cadow St., Pymble. JX3556
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nished job should not look as good, etter, than the original. However, covered cabinet is more likely to up to the type of handling a set is kind will encounter, and cover likely to be preferred on this score applying the covering, the normal ique is to cut the material so that ottom and all four sides may be ed with one piece, surplus material removed at the corners to allow at butt joint.

e first step is to glue the material e bottom, back and front, making that it is stretched tight in both tions and free from wrinkles, air ets, or any particles of foreign mat Smooth from the centre towards utside. To retain the material under on until the glue "takes," it may ecessary to secure the edges with or drawing pins. At front and these should be inside the cabinet position which will normally be n. The side pieces may be secured he bench by the extreme edges h will be cut to waste.

JE ALMOST SET

llow time for the glue to set suffi ly to hold the material under ten but not so much as to make diffi the removal of waste when the cor are being trimmed. To make a neat , allow the front material to extend nd each corner a little more than ssary before cutting, then fold up side and allow this to overlap the rial on the corner.

hen the side material is held secure- sharp knife or razor blade is used ut through both layers of material g the line of the corner. When the e is peeled away, it will be found the two edges butt exactly. They ld be pressed securely against the d and rubbed gently with a smooth ct, such as the handle of a knife. arefully made joint is almost in- le.

he same treatment is used for the lid the motor board and, when the glue curely set, the speaker opening and or cut-out may be completed. The r will merely need to be trimmed to exact shape with a sharp knife, but speaker opening needs to be covered he edges. Two diagonal cuts in the rial will allow it to be folded back all four sides.

this is your first attempt at a cover- job, it might be worth while to tice some of the more tricky parts, as the corners, with a scrap of erial on an old case or box.

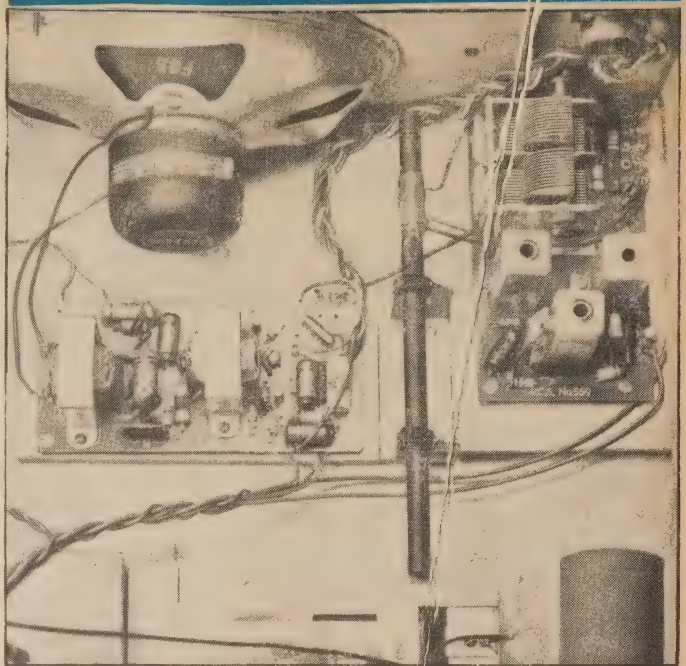
PES OF GLUE

wo types of glue may be used for job; the casein glue such as will bably be used to make the cabinet. 'hide' glue, as usually used by pro- ional cabinet makers. The latter is bably the best if correctly prepared used, but it should be freshly made hot enough to be almost water thin main advantages are its even consis- y and freedom from lumps and the that it commences to stick almost ediately.

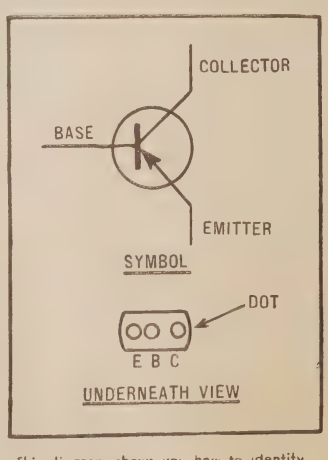
he casein glue is easier to prepare may be used cold, but may not be smooth if it is mixed carelessly. It ot particularly sticky in its liquid e, meaning that the material will e to be held taut by other means for a longer period. However, where time is not vital, this may not matter particularly.

The covering we used was a plastic type "leatherette" and which is available in a large variety of patterns and colours

ANOTHER VIEW OF THE CABINET



Another view inside the cabinet. Note that a dual concentric potentiometer is used for volume and tone control, while the switch at the rear is for the receiver proper. If there is any difficulty about obtaining a suitable potentiometer or knobs, the tone control can be omitted or mounted as a separate item on the motor board.



This diagram shows you how to identify the connections to the transistors. The TS1 and TS2 are smaller and round, but the collector side is identified by the dot of paint.

We chose a deep wine colour for the lid and beige for the body. This colour is also used for the inside top of the lid to provide an attractive contrast. However, there are a great many equally attractive combinations possible.

Reference to the cabinet drawing and the photographs will give a good idea of the layout, but some comment on this may also be helpful. The two circuit boards are supported on wooden blocks glued to the bottom of the cabinet in the positions shown, being supported on small spacers and held by wood screws.

In the case of the tuner board two blocks of wood are needed to raise the level of the gang shaft to that required to provide an attractive placing of the tuning knob. One block of ¾in ply and one block of 3/16 ply, plus ¼in spacers should give the required height. The audio board is not so critical, and a single ¾in block and spacers is all that is required.

SPACERS

Suitable spacers may be available commercially, or may be made by cutting sections from insulating pillars or brass tubing. If nothing better is available, a number of brass washers may be employed.

Two batteries have to be housed in the case; the 9 volt battery to operate the receiver (type 276-P or similar) and a 6-volt battery to drive the motor. The type 509 (or similar) lantern battery is

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— VACANCIES —

ANTARCTIC DIVISION

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Position:- Macquarie Island (1).

Duties:- To operate and maintain electronic and photographic equipment and to investigate Ionospheric, Cosmic Ray and Auroral phenomena.

Qualifications:- University degree with Physics as a major subject (or equivalent). Sound knowledge of, and experience in, electronics.

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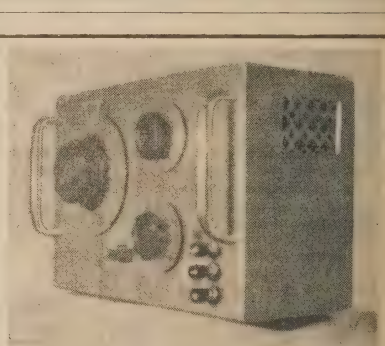
"PRODIS"
versatile Generator Mk 3



Sweep/FM/AM.

SPECIFICATIONS:

As Sweep Generator. 400Kcs-12Mcs, continuous 0-500Kcs sweep (calibrated). Output 30uV-30mV. (75 ohms).

As FM Generator. 400Kcs-12Mcs continuous, 15Kcs deviation 1000 cycle sinesoidal. Output 30uV-30mV (75 ohms).

As AM Generator. 400Kcs-12Mcs continuous 30% mod. 1000 cycle sinesoidal. Output 30uV-30mV (75 ohms).

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Robustly constructed, incorporates 5 tubes. Guaranteed 6 months.

Dimensions:
12" x 8" x 5"
AC mains 240V. Weight approx. 7 lbs.

Price
£46, plus sales tax.
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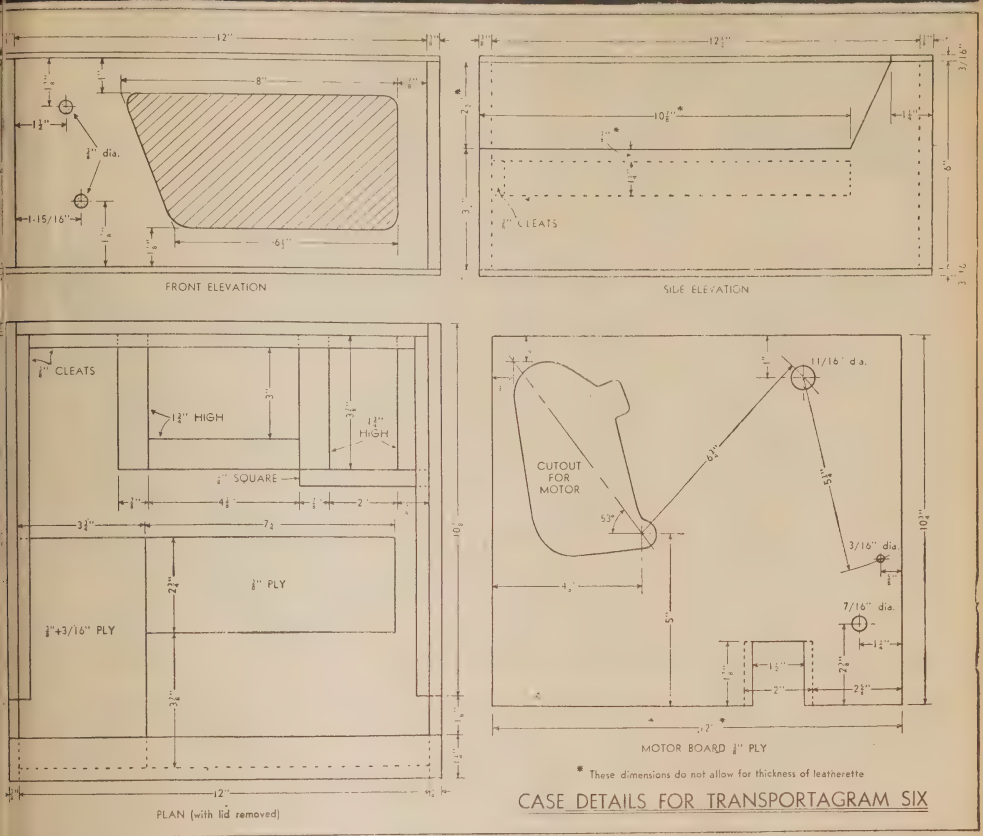
COMPLETE PLANS FOR BUILDING YOUR CABINET



Cost of the cabinet is likely to be a major item and there is a chance of considerable saving if you make it yourself. The best covering is probably plastic or "leatherette" but it could equally well be stained or lacquered.

ommended for the latter, although hy other ways of providing the neces- 6-volts could be suggested. How- r, the use of smaller cells would be economical and would have no par- lar advantages.

TTERY POCKETS

Both batteries are secured in pockets de from wood blocks glued to the tom of the cabinet. The arrangement such that either battery may be re- ved quite easily, being simply lifted ight out of the pocket. They are mally held in place by means of ber pads on the underside of the tor board.

The motor battery is supplied with coiled spring terminals (one coiled ing and one brass leaf in older types) it is easy to arrange a pair of metal ntacts inside the pocket which con- t with these automatically when the tery is inserted. We used two strips aluminium, approximately ½in by n bent to an "L" shape and screwed the top of the wood block.

The wood blocks are cut from a length 2 x 1 dressed timber (approx. ¾ x finished) or something similar. In case of the receiver battery it is necessary to allow for the battery plug, so the front of the pocket—corresponding with the top of the battery—is made from a small piece of 3/8in ply

The rubber pads on the underside of the motor board to hold the batteries in place are ordinary gang mounting rubbers. It will be necessary to provide a small wood block for each to ensure correct pressure, and a scrap of 3/8in ply will serve for the receiver battery, and 3-16 ply for the motor battery. The rubber pads are glued to the wooden blocks with cellulose cement.

The battery connections to the motor call for some attention. Because it is a permanent magnet motor, incorrect polarity will cause it to run backward. Such an arrangement has its lighter side by allowing records to be played backward—and to produce some weird and amusing sounds as a result. Otherwise, the leads should simply be transposed to provide the correct operation.

It is also important to connect the battery to the correct motor terminals, otherwise the motor may run without any governor action, and at much higher than normal speeds. The governor is simply a weighted contact which opens a circuit whenever the motor reaches a certain critical speed. This puts a 330 ohm resistor in series with the motor, effectively reducing its speed until the contact closes the circuit again.

Three terminals are provided on the motor, the resistor being mounted between the centre and one outside one. The battery leads should be connected between the centre and the opposite outside terminal.

Reference to the circuit will show the switching necessary to accommodate the gram. facilities. When the latter is required the hot end of the volume control is switched from tuner board to pickup, the collector circuit to the tuner is opened, and the battery circuit to the motor is closed.

SWITCH

This is accomplished by means of a three pole, two position switch mounted on the motor board just below the pick-up head. Five leads run from this area to the circuit boards (two collector circuit and three audio leads) and are plaited for neatness. Note that the audio leads do not need to be shielded due to the low impedance of the circuits involved, and that the cable should be long enough to allow the motor board to be

TAPE RECORDER AND RADIO COMBINED!

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VL.23

£155/10/-
WITH RADIO

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STANDARD

Attractive colour scheme; two-tone green exterior with grey top.

OPTIONAL ACCESSORIES:

Extension speaker for quality sound reproduction. Foot switch for office dictation purposes. Headphones for use by typists, stenographers, etc. Suitable for use with many types of microphones.

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189 BRIDGE ROAD,
RICHMOND

d back easily for battery replace-
t.

he .22M resistor shown in series with
pickup lead (necessary to provide
er matching for this device) is mount-
between the appropriate switch con-
and a tag strip screwed to the un-
ide of the motor board. Two more
s from the switch run directly to
motor and battery respectively

NE CONTROL

he other circuit change is the addi-
of a tone control. This is best pro-
d by means of a dual pot. with a
element in each section, plus a
ch on the volume control shaft to
ch the collector current as in the
inal circuit.

**This can be accommodated in the
osition shown only if a midget type
used, otherwise it will certainly
oul a 12in record. Such a unit
hould be available from at least
ne manufacturer but, if this cannot
e obtained, a separate tone control
ot. may be mounted in a conveni-
nt position on the motor board.**

ssuming that a dual pot. is used it
uld be mounted as close to the front
the cabinet as possible. A small
ninium plate supports the control,
is mounted flush against the inside
he cabinet. A recess must be cut in
wood to allow for the pot. mount-
nut, and is best provided by remov-
two layers of ply with a sharp chisel
area of about ¾in square is suffi-
it.

ix wires run to this unit, three audio
els, two switch leads and one tone
trol lead, the "earthy" audio lead
ing as a return for the tone control
uit. The .02 mfd tone control capa-
r is mounted between appropriate
h on the tone and volume pots.

he speaker is an oval type, nomin-
5 by 7 inches, and is a very effici-
little unit. It is available in two
sions from one manufacturer, the "F"
the "L." The "L" has the higher
sitivity and should be specified in pre-
nce.

t is mounted on a baffle cut from
6in ply, and this should be painted
k to prevent the shape of the cut-
being visible through the speaker
le. The latter is of expanded alu-
ium and should be mounted with the
nings facing downwards. It is sim-
sandwiched between the front of the
inet and the speaker baffle, the lat-
being fastened with wood screws

AGNET CUT-OUT

To accommodate the speaker mag-
it is necessary to provide a small
-out in the front of the motor board.
shown in the drawing, this needs to
1¾in wide at the top, increasing to
2 on the underside to allow for the
vature of the magnet. This is most
ily provided by cutting away about
ee layers of ply over the 2in width.
ng a sharp chisel.

The bracket for the ferrite aerial rod
mounted between the tuner and audio
ards on the same block used to sup-
rt the latter. The leads may need to
extended slightly to reach the appro-
ate points on the circuit board, but
not particularly critical.

Incidentally, wood screws suitable for
ounting this bracket and for other ap-
ications where only a single layer of

(Continued on Page 127)

AUDIO *for* STEREO

A full range of Stereophonic playing equipment is now available from Audio Engineers. Stereophonic Pickup Cartridges; Ronette Binofluid BF-40 with Sapphire £4/5/6; with diamond £10/12/-.

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See advertisement elsewhere in this issue.

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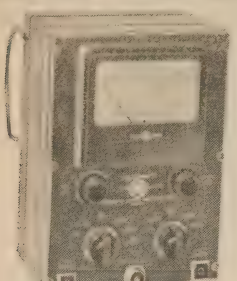

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PRICE £42

plus tax 12½%.

30 KV EHT Probe for above £6/-/- plus tax.

R. F. probe (50kc-220 Mc) for above £4/-/- plus tax 12½%.

- EASY Terms available on ALL test equipment. Bank rate of interest only. New 90 day interest free Credit plan. All N.S.W. and towns in Victoria and Queensland.
- Literature available on all instruments.
- If you have a TV test instrument requirement, local or overseas, let us know. Demonstrations may be arranged anytime to suit yourself. No obligation to purchase.
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A reliable push-pull output unit for normal P.A. work.

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General Specifications: 5 valves—twin chassis kit, consisting of:—(1) power unit, and (2) main amplifier unit, which includes bass amplifier and voltage amplifier—treble amplifier and phase inverter—push-pull driver stage—push-pull triode output stage with multi-tapped output transformer (plus minus 1 db 40 cps.—15,000 cps.) Very easy to assemble. Output 13w Three controls—Bass, Treble and Volume

OUR PRICE—£18/5/-. OUR MAIL ORDERS COVER ALL STATES.

573 FLINDERS LANE MELBOURNE

ELECTRONIC DEVELOPMENTS

MB2078

FROM THE SERVICEMAN WHO TELLS

There seems little doubt that public interest in TV continues at a very high level. The questions asked of myself and my colleagues is proof enough of that. In the circumstances it is rather disconcerting to realise that a lot of false notions are still being circulated by thoughtless or ignorant members of the trade.

NE of the most common questions I am asked goes something like this: friend of mine—" (or a relative)— o lives over in such-and-such a sub- has just had a TV set installed and salesman told him so-and-so and n-and-such. Is that right, or is it only arn?"

ven if I am not told outright, I know in many cases the deal has not been finalised. Instead, the prospect- customer has deputised his relative obtain a second opinion over the btful point, preferably from some- with no axe to grind. However, I 't imagine that they pick on me for other reason than that they know or because I'm handy.

NSIBLE OR NO?

he "so-and-so and such-and-such" is metimes a perfectly accurate statement as often as not, it is a blatantly iculous one invented on the spur of moment to cover up some awkward ation; a situation invariably involving failure of a new set to perform as customer thinks it should, or the fail- of the customer to spend as much ney as the salesman thinks he should. nd how some of these imaginations riot!

couple of the stories I have collect- during the past few weeks are worth elling, if only to provide an oppor- ity to discount them.

n the first case two prospective cus- ers — a man and his wife — had ched the stage where they had set r heart on one particular model re- er. As is so often the case they had ed their choice almost entirely on the inet design; its size, its colour and styling. As it turned out, this became important point during subsequent otiations.

COND THOUGHTS

he set was duly installed on a trial is and, in the first flush of enthusiasm, ryone seemed quite happy with its formance. However, after a day or they noticed one or two things which ried them. One was the very prob- I discussed last month; a bright spot the middle of the screen after the set s switched off. The husband, at least, that this was something which could langer the precious picture tube.

The second was even more annoying. was described as "a low pitched buzz- sound in the speaker" — obviously me buzz — and was apparently loud ugh to be heard behind most program terial. It didn't take much of this to d the prospective purchaser hurrying k to the dealer in search of explana- ns.

As regards the spot, the dealer did not pear to be particularly worried. He plained it simply as a characteristic of that particular model, with the comment that it didn't matter and that there was nothing that could be done about it anyway. So that was that.

In the matter of the frame buzz he was a little more considerate — though not much. He agreed that it was undesirable, but once again was inclined to shrug it off as a characteristic of the set, and about which very little could be done.

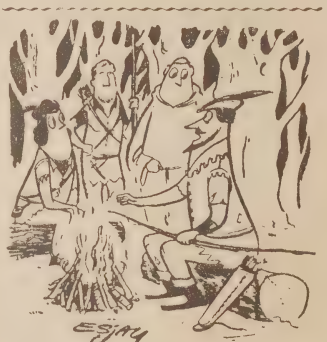
In greater detail, he explained it as being due to the style of the cabinet; this being one of the later designs in which the depth has been considerably reduced over very early models. According to the dealer, this had necessitated the use of a smaller chassis, causing certain wires to run too close to other wires, and thus producing the buzz.

See what I mean?

Such an explanation of frame buzz has all the earmarks of a pure fabrication.

In the first place, latest cabinet styles have not resulted in chassis being reduced in size by a major degree. Most of the saving has been due to the use of wider angle tubes with shorter necks, most chassis being only slightly modified to take full advantage of these.

However, even assuming that there was a substantial reduction in chassis size,



"I wish someone would invent Television. We'd make a fortune!"
—TV Times.

frame buzz is not normally a product of "wires too close together." Apart from poor design or poor alignment, it is often caused by cross modulation somewhere in the IF amplifier and due, in turn, to overload of the stage concerned. In more practical terms, it is a frequent product of "over aerialisation" in strong signal strength areas.

The dealer made some show of attacking the problem by removing the back of the cabinet and, he claimed, moving the offending wires. At first the customer imagined that this had improved things slightly, but was less definite about this after more prolonged observation. (The fact that this buzz will vary with video content makes it difficult to accurately assess the "degree" of interference. This could easily account for confusion on the part of the customer.)

But, better or not, he had no doubt that it was still intolerable, thereby creating something of an impasse. The customer wanted that particular model set because he—or rather his wife—wanted that particular cabinet style. But he wanted it without the frame buzz and, preferably, without the spot as well, while the dealer seemed unable or unwilling to do anything about either.

STILL NOT SURE

And that was roughly the situation when the story was related to me. I am not sufficiently familiar with the particular make of set to be able to say whether the spot was a normal characteristic or not. All I could suggest was that the customer contact the makers and find out if they also considered it of no importance. If they did, we can only hope that they would be prepared to stand behind the tube guarantee if the screen should suffer a burn.

I was able to be more definite in the matter of the frame buzz. No set should have so much frame buzz that a customer (normally the least observant person in regard to fine points of design) should be acutely conscious of it under normal listening conditions. If it does, it is either of fundamentally poor design or has a serious fault, and is a case for the service bench. Always assuming, that is, that it is not being hopelessly overloaded by an aerial designed for fringe area reception.

JOB FOR MAKERS

As far as I could see this was also a job for the makers The customer had set his heart on that particular set and wanted it free from obvious defects The dealer was unable to help, so the makers were surely the only ones left If they were unable to help, then it would have to be accepted that the fault really was characteristic of this model. In this event another make of set would seem to be the only solution—undesirable cabinet style notwithstanding.

Personally I would be surprised if any firm worthy of the name would risk losing sales over such an obvious defect As far as that goes, I am surprised at any dealer adopting such a casual attitude. Most of the dealers I know would try to make sure that, if a customer wanted a particular set, then that set would be in tip-top condition before it was delivered.

In the rare event that a set should fail while on demonstration—and this can

MASTER ELECTRICS PTY. LTD.

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All Brand New and Boxed.

Type VCR 138 3½in diameter cathode ray tube. Ideal for oscilloscopes, etc.
Characteristics: Filament Volts 4
Filament Current 1 amp.
Anode 2-200 volts
Grid 1-50 volts
X plate sensitivity .14
Y plate sensitivity .33
Anode 3-1, 200 volts
Electro-static deflection
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Socket connections can be supplied to each purchaser. Price 25/-.

Type 815 Push Pull RF Beam Power Amplifier. Used as class AB2 A.F. Power amplifier and modulator. Max. output: 75 watts.
Class C Telegraphy max output 75 volts
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Filament volts 2.6 or 6.3.
An excellent valve for H.F. work. Brand new and boxed. Our price 35/- each.

Type EL50 Power Output Pentode. 6.3 volts filament with P type base 2 of these valves in class B will give 80 watts output. This is also an excellent single end tube which will give in Class A about 8 watts output and high gain. Well worth 30/-. Our price only 7/6.

Detector Amplifier Pentode 6.3 volts filament for UHF work. Price only 5/9 each.

Valves	Price	Valves	Price
1S5	8/6	B409	5/
1T4	8/6	B605	5/
1R5	8/6	CF1	9/6
26	5/-	CB1	9/6
34	5/-	DF31	8/-
37	8/6	E424N	5/-
38	6/	FC13	9/-
46	5/	FC2A	5/-
49	8/6	PM12A	5/-
VR54	5/	PM256	8/6
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71A	5/-	IF5G	8/6
76	7/-	866A	19/6
77	7/-	VR91	7/6
85	5/-	KF1	5/-
VR130	3/6	KF2	5/-
6R7	7/6	KK2G	7/6
2A3	12/6	PM24M	6/-
VT75A	3/6	PM4D	5/-
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VT502	3/9	U50	5/-
506	6/9	UX120	3/6
VT138	5/-	VR52	5/-
A442	5/	A209	5/
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ARP34	5/	SP2M	7/6
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		VT120	3/6

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as illustrated, 4 valves Broadcast in bakelite cabinet, with vertical dial 5in speaker and separate vibrator pack. Ideal for caravans etc. Worth £29/10/-.

Our price £12/10/-.

5-Valve Dual Wave in Brown Bakelite Cabinet, with 6in speaker and built-in vibrator pack. Worth £43/10/-.

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1. Bakelite resistor strips each with the following components attached.
   5 — .25 — 500 VDC wkg paper Tubular Condensers.
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   1 — 56,000 ohm 3W Carbon Resistor.
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   Price only 2/9 ea.
2. 4 Speed Electric Gramo Motors to operate from 230 volts AC Supply, each has control knob with 16, 33, 45, and 78 R.P.M. positions and on and off switch. Ideal for playing all types of recordings. An excellent job, these are brand new and boxed. **Price £5/10/- each.**
3. Coil Winding Wires. Wind your own coils for crystal valve sets etc. Below are listed popular wires and prices per yard and per ¼lb reel.

B and S	SWG	Enam. per yd.	Enam. per ¼lb reel
15	17	5d	
16	18	4d	
18	19	4d	7/6
20	21	4d	8/-
22	23	3d	8/3
24	25	2d	8/9
26	27	2d	9/4
27	29	2d	
28	30	1d	10/9
29	31	1d	
30	33	1d	11/3
33	37	1d	14/6

★ SPECIALS ★

4. **Germanium Diodes.** English make, brand new and perfect. Equal to 60ft outside aerial. Ideal for use as Crystal detectors, rectifiers, etc., in radio and TV sets. **Only 3/11.**
5. **80mA Power Transformers.** 230 volts input. Secondary 385 volts aside. 2.5V at 5 amps. 5V at 2 amps. 6.3V tapped at 4 volts at 3 amps. Brand new and boxed. Worth £3/15/. **Our price £2/10/ ea.**
6. **Ferroxcube Rod Aerials** with coil, ideal for portables, mantel sets **Price only 16/6 each.**
7. **230 to 110 volt Auto Transformers.** 400 volt-amp 50 C.P.S. Ideal for adapting 110 volt equipment to operate off 230 volt AC mains. Made in U.S.A., brand new and boxed. Worth £21. **Our price, £5 each.**
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9. **2-Gang Variable Condensers.** .0005 capacity, brand new and cartoned. Worth £1/10/. **Price only 12/6 each.**
10. **4-volt Vibrator Power Supply** will give 100 volts DC, and bias for output tube on battery sets. Neat and compact job. Brand new. Worth £6/10/. **Our Price £2/17/6.**
11. **Magnetic Pick Ups.** English make with bakelite arm for 78 r.p.m. records. Light weight. **Price 7/6 each.**
12. **PM 957 Ferrocart Vibrators,** 12-volt synchronous, split reed with octal base. Socket connection diagrams available. **Price only 10/ each.**
13. Bakelite Formers can be supplied cut to the length you require.

Diameter	Price per inch
¾in.	5d
1in.	5d
1¼in.	6d
1½in.	6d
2in.	8d
2½in.	9d
3in.	10d

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Branches throughout Victoria and New South Wales

ripper—they would certainly not try to
ug it off with a take-it-or-leave-it at-
ude. On the contrary, they would have
eplaced or repaired in record time—
before the customer had a chance
go cold on the idea of buying a set
m them.

Another case concerned an interfer-
e pattern in the picture. It was de-
bed to me as consisting of two thin
s, dark but rather broken up on
se inspection, which rolled slowly up
down the screen.

My immediate reaction to the descrip-
n was to enquire if there were any
power lines in the vicinity.

"Oh, yes," was the reply, "there's one
ning in front of the house and an-
er some distance away on one side.
matter of fact, the one on the side
between the aerial and the stations."

AINS INTERFERENCE

While not a gambling man in the usual
y, I would be prepared to lay almost
odds that the trouble was interfer-
e from the HT mains. To anyone
o has ever experienced it — and I
nk most servicemen have had at least
ew cases by now — the description
unmistakable.

Briefly, it is caused by leakage either
oss or through the insulators. In most
es it is across the surface, and is
ggravated by dust, but a faulty insulator
n also be to blame. Where dust is the
in cause, a shower of rain will cure
trouble in a matter of minutes, and
p it at bay until dust can settle again;
period varying between days and
eks.

In fact, if any further confirmation
re needed as to the cause I would
that this would be it. Simply wait for
hower and see if it stops.

The reason for the definite pattern of
narrow bars is fairly easy to explain.
st of the leakage occurs at the peak
each half cycle and would be of maxi-
m severity for a comparatively short
rtion of the cycle. Thus the bar would
narrow relative to the picture, while
re would be two such peaks per cycle,
100 peaks per second for 50 cps
ins, and two bars per picture.

The roll, of course, is due to the dif-
ence between the nominal 50 cps of
mains, and the more accurate, crys-
derived frame frequency from the TV
tion.

EALER'S STORY

All of which is quite simple, and easily
derstood by most people with even a
all knowledge of radio or TV. But
at did the dealer tell the prospective
stomer when the latter drew his atten-
n to it?

"Oh, that's nothing to do with the
ceiver," was his glib reply. "That's
ming from the transmitter."

For sheer effrontry this statement will
e a lot of beating. Did the dealer
lly believe that any customer would be
naive as to swallow such a story?
not to enquire why, if the trouble
s at the transmitter, it was not appar-
t on sets belonging to friend in more
vourable areas?

In fact, that is exactly how the cus-
mer had reasoned in this case and he
s extremely suspicious of the story. I
d no hesitation in confirming these
spicions, and passing on a simplified
rsion of the explanation given above.
uipped with this knowledge, he should
in a better position to make up his
n mind about both the set and the
aler.

I considered I had done my good deed for the day.

Reverting to service problems, I have a story which, quite apart from its technical interest, provides considerable food for thought on the whole question of economical servicing.

It is not one of my own case histories and, quite frankly, I'm very glad it isn't. This is the kind of fault which no serviceman should ever be asked to find; the kind which can create untold amounts of bad will as far as the customer is concerned, plus headaches, ulcers, and straightout financial loss for the serviceman. And, ironically enough, no one can really be blamed quickly — a fact which they proceeded to demonstrate.

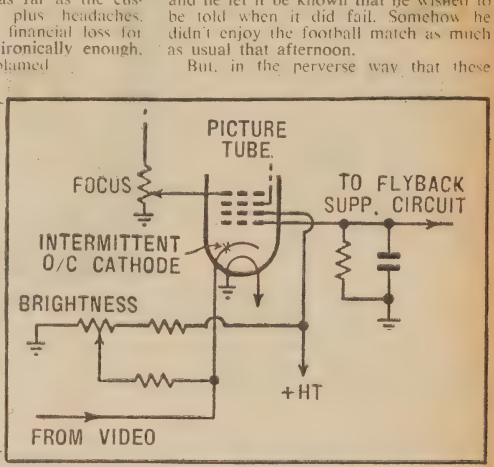
And so the immediate problem of how to see the afternoon's football match was solved, but my friend was far from happy with the situation. The fact that the set had a fault in it was bad enough, but his being the last to know about it was simply adding insult to injury.

He resolved that the next time it happened the set was going out on to the work bench for a thorough overhaul, and he let it be known that he wished to be told when it did fail. Somehow he didn't enjoy the football match as much as usual that afternoon.

But, in the perverse way that these things behave, the fault showed no signs of reappearing. Days passed, grew into weeks, and still there was no sign of the fault. It would not have taken much to persuade my friend that he had imagined the whole thing.

Of course it had to happen eventually (otherwise I should not be telling this story) but it was several weeks before it did. When it did my friend was as good as his word. He cleared a space on the work bench, dusted off his multimeter, and carefully extracted the chassis from the cabinet. Then, equally carefully, he set it up on the bench and proceeded to check all relevant components and circuitry

An open circuit picture tube cathode would seem like a simple enough fault in the ordinary way, yet the intermittent nature of it in this case put it into the well nigh "impossible" class. Solving the problem on a mutually satisfactory economic basis would tax the ingenuity of any serviceman.



(I imagine that if His Satanic Majesty has a special department set aside for delinquent servicemen, then this is the type of fault he would set before them as punishment for the dry joints, dishonest statements, and overcharges which they perpetrated while on earth. I must try to be a better serviceman in future).

The set concerned was a home-made TV receiver, the original R. TV and H. 17in model to be exact, and the owner-builder was a friend of your Serviceman Although not engaged in radio professionally, he is a very keen enthusiast, well clued up, and with a fair amount of experience behind him. As a result, he made a first-class job of the set and experienced very little initial trouble in getting it working correctly.

For several months after he built it, it performed perfectly, and he had come to take its performance almost for granted. Then one Saturday afternoon he switched it on to watch his favourite sporting fixture, only to find it behaving in the most disturbing manner. The brilliance had dropped noticeably, there was only the vaguest suggestion of a picture, and the retrace lines were painfully obvious.

EFFECT OF CONTROLS

Advancing the contrast control to maximum improved the picture slightly, though it was still a long way short of normal, while the brilliance control proved to be completely ineffective. At this stage a member of the family intervened, and there followed a scene which I imagine was very similar to one which I described in the August issue.

The family, it seemed, had already encountered and overcome this problem, without bothering to tell poor old Dad a thing about it. They, too, had discovered that such faults could be cured by switching the set off and on again

PICTURE TUBE CIRCUIT

There seemed to be little doubt that the trouble involved the picture tube circuitry and, in particular, the grid and/or cathode circuits. My friend went over this part of the set and for some distance around it with the ohm meter, checking the connections, resistors and, to a limited degree, the capacitors.

He could find nothing wrong. No dry joints, no faulty resistors, and no obvious shorts in the capacitors. Satisfied that these points were OK he switched it on in anticipation of making a voltage check — only to find that the set produced a perfect picture as soon as it warmed up. He prodded, probed, and bashed at the chassis in vain; the set was working, and obviously intended to stay that way. So, somewhat regretfully, it was fitted back in the cabinet.

There was not much that could be done now except wait for the trouble to appear again, and to hope that this did not take too long. But the fault was not going to be hurried. Several more weeks were to pass before it occurred again, and this time my friend encountered another problem.

The rest of the family were not easily

then you'll need one of the 3

Building a TV set?

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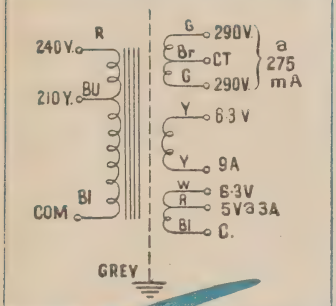
* RH275/290



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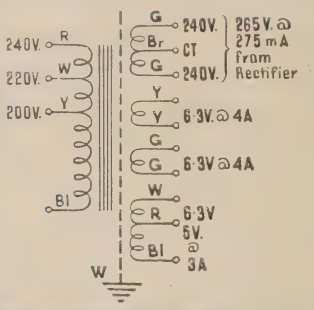
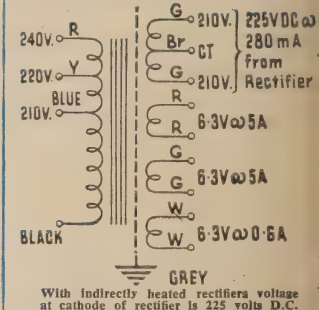


TV280/210



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nvinced that there was any need to
ddle" with the set. They knew the
ouble could be fixed by simply flicking
off and on a few times and it seemed
intless to miss a favourite program
st to find out why the set was like that.
s a result, this check had to be made
the brief time available before the
xt program started.

It was much the same as the last one.
othing obvious the matter, and perfect
rformance immediately the set was
itched on again. So back it went into
e cabinet once more — in time for
e program. However, my friend had
ade up his mind on one thing. The next
ne the trouble occurred he was deter-
ined that it was going to be checked
ght there on the spot; immediately,
thout switching off, and regardless of
e program.

NOTHER WAIT

He didn't have to wait quite as long
is time for it to recur — only about
n days — and when it did it was a
ore opportune time. Being careful not
disturb anything more than absolute-
necessary he carefully moved the set
it from the wall, slipped the back off
e cabinet, and attacked the picture tube
cket.

Prizing it off the base very slightly, so
to reveal the pins, he proceeded to
easure the voltages applied to the vari-
ts electrodes. These appeared to be nor-
al, and it was also established that the
thode voltage varied with the bright-
ss control setting, exactly as would be
pected. Yet the screen brilliance still
fused to respond to the control. (It
me good of its own accord a few
oments later.)

This was a rather sobering discovery.
normal voltages are applied to a pic-
re tube and the latter does not respond,
ere would seem to be only one explana-
on; a faulty picture tube.

Of course, there could be other ex-
anations, such as faulty socket or dirty
se pin, but these seemed unlikely. In
y case, they were quickly checked and
rtually eliminated. To provide further
nfirmation, the next couple of failures
ey were occurring somewhat more fre-
ently now) were cured by gently tap-
ng the neck of the tube with the handle
a table knife — the first thing that
ppened to be handy.

IATURE OF FAULT?

The next question was the exact nature
the fault. Was it an open cathode
nnection, or could the grid give a
milar effect if it were open? And, most
portant, was the defect within the tube,
merely in the base pins?

My friend was most inclined to blame
e cathode, since it has both video and
ightness voltages applied to it. On the
ther hand he tried to visualise what
ould happen if the grid were open. The
thode can only be varied, as regards
oth brightness and video voltages, if the
id voltage remains fixed. What happens
an open grid, and what potential it
ssumes, is one of those problems about
hich there are so many "ifs" and "buts"
at it is hard to provide a satisfactory
nswer.

However, he did consider it a possi-
ility that an open grid would tend to
follow" the cathode voltage, thus large-
bucking both the DC and video volt-
ges applied to the latter.

In an effort to clarify these points he
ecided to simulate both conditions arti-
cially. First he disconnected the grid
lead at the socket and checked the effect. Most of the picture had vanished as with the real fault, but instead of a drop in brilliance there had been a notable increase. It seemed it was not the grid which was at fault.

However, when he opened the cathode lead the effect was reproduced exactly, leaving little room for doubt that this was the electrode involved.

There remained only one question to answer. Was the cathode lead broken inside the tube, or was it only a faulty connection in the base pin?

A check on the base pin showed nothing obvious, but it is often difficult to be absolutely sure in such cases. In the circumstances there was not much more that could be done except to resolder the joint in such a manner as to leave little doubt as to its effectiveness, then wait and see what happened.

That was a couple of months ago, and my friend has almost reached the stage where he is prepared to uncross his fingers. I say almost because he tells me he has just had a vague indication of a repeat performance.

The daughter of the house has reported that: "The set went funny again today, only I don't know whether it really was the set or because I didn't have that thing in the right place." ("That thing" was the fine tuning control.)

STILL WORRIED

All of which is delightfully vague and disconcerting and has put my friend back on tenterhooks again with his fingers more firmly crossed than ever. I only hope he solves the problem, one way or the other, without too much delay. The strain seems to be getting him down.

However, regardless of the final solution, there is one extremely important question which arises out of the entire case:

How would, or should, a regular serviceman have tackled a problem like this?

Assuming that my friend had been a regular non-technical TV user, and had called in a serviceman at the first sign of trouble, what chance would the serviceman have of finding it?

As we have seen, the trouble did not repeat itself for many weeks, and then only briefly, to be followed by another period of many weeks. The most conscientious serviceman could do no more than thoroughly overhaul the set, report no fault in evidence, and return it to the customer.

For this service he would either make a straight-out charge, defer his charge in the hope that the trouble would declare itself completely and allow him to come to grips with it, or perhaps make no charge at all in certain cases.

SERVICEMAN'S PROBLEM

But, whatever he chooses to do the first time, it is fairly obvious that it cannot be repeated over and over as could be required in a case like this. If he makes a straight-out charge every time, the customer is going to protest pretty promptly. On the other hand, he cannot afford to go on giving free service checks in search of a fault which he has never even seen. For all he knows the customer may be imagining the whole thing.

Nor is there much chance of him seeing it. No matter how quickly he was called or how promptly he responded it would probably have cleared itself before

(Continued on Page 119)

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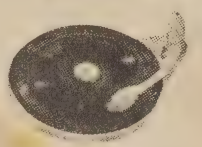

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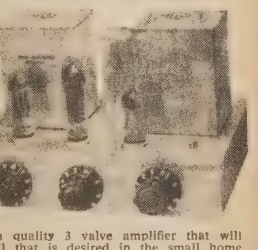

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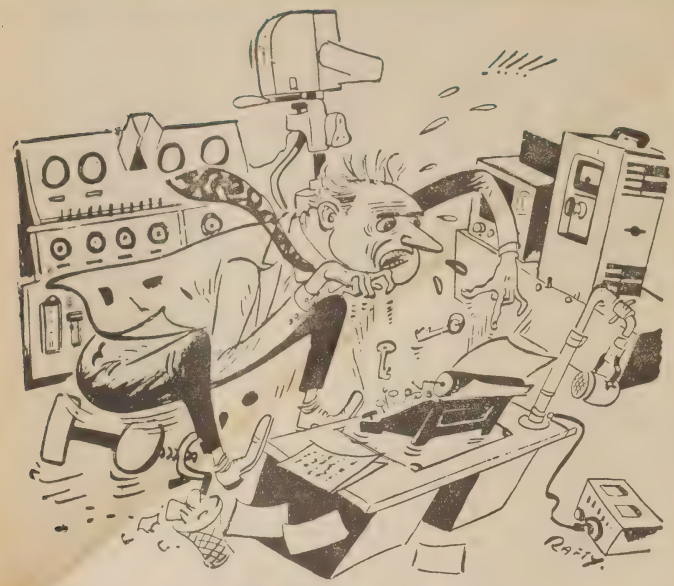


Let's Buy An Argument

There has been a spate of letters lately involving the old, old problems of voltage and current in a resistance-coupled voltage amplifier. The one on the opposite page is typical. Having read it, "old timers" can yawn wearily and turn to another article — or skip the first page or so. Newcomers should read and inwardly digest.

by Neville Williams

WHAT has happened in R.Y.'s case is clear enough. Launching out on the unfamiliar sea of circuit data, he has discovered that the "official" plate current of a 6J7 as a class A amplifier is 2 milliamps, "with 250 volts on the plate."

Since most circuits provide a B-plus voltage of this order, he reckons that the plate current figure should normally lie fairly close to 2 milliamps.

OHM'S LAW

But R.Y. has also learned recently about Ohm's Law and a simple calculation based on it suggests that there would be greater voltage drop across the plate supply resistor than there is voltage in the first place! Something is obviously wrong.

A further calculation reveals the same impossible situation in the screen circuit. Hence his dilemma. His newly acquired theory has laid an egg.

It rather reminds me of some of the pet cockies I have read about, who did likewise after 20 odd years of being mistaken for a male!

Very naturally, there is an explanation for the "impossible."

If you look at the ratings, you will find that they state that the plate current of a 6J7 is 2 milliamps and the screen current is 0.5 milliamp, with a plate voltage of 250, a screen voltage of 100 and a bias of minus 3 volts.

You may recall that, in a recent article, we pointed out that American practice is to relate all voltages to the cathode. When measuring voltages against earth, it is therefore necessary to allow for any voltage drop across a cathode bias resistor.

Thus, in a normal cathode-biased circuit, one could expect to find approximately these currents flowing with a measured voltage of 3 earth-to-cathod 103 earth-to-screen and 253 earth-t plate.

I have inserted the word "approx mately" quite deliberately, because th actual current drawn by valves of th same type may well vary by some 10 20 per cent from the published figur However, as I have said, one can b expected to find currents of the state order — provided the stated voltag conditions are observed.

This last phrase contains the key to R.Y.'s problem, because the simple fact of the matter is that this exact distribution of voltages is seldom present at the valve pins in a normal resistance coupled circuit.

Let's just have a chat in print abo this whole question.

PLATE LOAD

In a practical circuit, some kind load device is normally connected the plate circuit, a resistor, a choke, t primary winding of an audio transform or the primary of an RF or IF co According to its nature, it will have particular order of DC resistance a will introduce some voltage drop b tween the voltage supply point and t actual plate pin.

In the case of an IF or RF coil, even an audio transformer winding, t voltage drop may not be very great a the effective plate voltage will therefo not be much less than the supply. If t latter happens to be about 250, and the screen and bias conditions are su ably arranged, then the valve could reckoned to be operating near enough the published typical operating conditio as a class A amplifier.

PRECISE VOLTAGES

Of course, if we were going to arg about the precise plate and screen c rent, "near enough" would not be go enough. It would be necessary to ma pulate the supply voltage to bring t plate, screen and bias potentials ri on the dot before judgment could passed about the accuracy of the make current figures.

When it comes to resistance couplin the voltage drop across the plate lo resistor is necessarily large and must taken into account, one way or anoth

Let's say that we did want to opera a 6J7 as a resistance-coupled amplif with potentials and currents as per t published "typical operating conditions Class A."

If the plate load resistor was to

meg., the drop across it, with 2 illiamps flowing, would be 200 volts. lowing for this and the further drop ross the cathode bias resistor, the total pply voltage necessary to achieve the ndition would be 250 plus 200 plus 3, uals 453 volts.

We might also work out that the reen supply resistor would have to roduce a voltage drop of 353 volts at 6 milliamp, equals .706 megohm.

In actual fact, it is not likely that e average piece of equipment will have 3 volts available as a source of supply, that the condition envisaged is an possible one in many cases.

One might assume, alternatively, that e value of the plate load resistor could reduced progressively, with lower or- rs of supply voltage available, so that e 250-volt plate condition could be eserved.

FFECTS OUTPUT

The catch to this is that it imposes progressive reduction on the gain and ak audio output of the valve, because e audio output volts are dependent in rge degree on the Ohm's Law product the alternating plate current and the ate load resistance. Make this last- med too small and output suffers badly, ong with stage gain.

In short, the typical class-A amplifier conditions to which R.Y. refers are given purely as a guide to the valve's operation in circuits where the plate load device does not introduce any substantial voltage drop. Perhaps we should add . . . . or greater than can be offset by a practical increase in the supply voltage.

When it comes to resistance-capacitnce coupling, these typical operating nditions are virtually useless except rhaps to indicate, in a general way, at the valve has a naturally high, edium or low order of transconductnce, plate resistance or amplification ctor.

A completely different approach is illed for. The designer proceeds on ie assumption that a certain order of ipply voltage is available and that a rge proportion of it will be absorbed the plate load resistor. His job is to etermine a value for the load resistor nd for other circuit constants, which ill ensure the best overall efficiency in rms of stage gain and peak signal voltge output.

OAD LINES

He may be able to extract the necesary information graphically from the alve characteristic curves by plotting soalled "load lines" on them. On the ther hand, if suitable curves are not vailable, he may have to find the anwers experimentally, on a trial and rror basis.

Here are some of the limiting factors which operate, when selecting a value or the plate load resistor.

If the value is made very small:

(1) The plate voltage will be comparatively high, allowing the valve to draw ubstantial current and show high transonductance. This latter would be in the nterest of good gain.

(2) Since signal voltage developed in he plate circuit is dependent in part on he product of alternating plate current nd plate load resistance, too small a value of resistance makes it difficult to develop a high signal voltage in the plate circuit. This therefore counteracts the benefits of high plate current and transconductance, in respect to both output and gain.

(3) Unnecessarily high plate current is a disadvantage in that it increases the total high tension drain to no purpose and may also complicate the task of decoupling or filtering.

Conversely, if the plate load resistor is made very high in value:

(1) The effective plate voltage is much reduced and the valve cannot draw high standing current. The transconductance is lowered as a result, tending to counteract the anticipated increase in output and gain with higher values of load.

(2) If the total effective plate circuit resistance becomes too high, due to a large increase in the value of the plate load resistor, stray circuit capacitances may become significant for high signal frequencies, leading to loss of treble response.

(3) A stage may be reached where further increase in the value of plate load resistor makes little difference to the gain and output, quite apart from plate current and transconductance. Reason for this is that the true AC output load for a valve is the parallel resultant of the plate load resistor and the following grid resistor. The valve's own dynamic plate resistance is also significant. In the case of a triode, for example, there is little point in making the plate resistor more than 5 to 10 times the nominal dynamic plate resistance.

It is the job of the circuit designer to arrive at suitable compromise values such that performance does not suffer unduly from either too low a value of load resistance, too low an effective plate voltage or from too low a ratio of shunt reactance to resistance.

SUITABLE BIAS

Having selected a suitable value (or range of values) for the plate load, it is necessary to nominate a suitable bias for each case and work out a value for the cathode bias resistor.

In the case of pentodes an extra complication exists in that a given order of plate current can be produced by different combinations of screen voltage and bias. Not all such combinations of screen voltage and bias are optimum, however, in terms of stage gain or voltage output, for a given order of distortion. The best one needs to be chosen.

Fortunately, valve makers have not left us to wallow in this sea of uncertainty, because resistance-capacitance coupling data is available for most valve types likely to be used in this class of circuit.

Thus, had R.Y. looked a little further afield, he might have come across data for the 6J7 in R/C coupled circuits, for either triode or pentode connection, with different orders of HT supply voltages, different values of load resistor and following grid resistor, giving optimum screen supply resistor for each case, optimum bias resistor, peak output and stage gain.

Such data, as a rule, does not give the actual electrode voltages and currents, mainly because it is not necessary to know them. The implication is that, if the valve is used with the quoted circuit constants, it will give the stated order of gain and output voltage.

PLATE VOLTAGE

Purely as a general guide, the voltage at the plate of a resistance-coupled amplifier usually finishes up at about one-half the supply voltage. The current is about half that which would flow if the plate end of the load resistor were short-circuited to earth.

In the case quoted by R.Y., the supply voltage is 200, with both a decoupling resistor and a load resistor between it and the plate. We might expect the plate voltage to level at something under 100 volts for optimum condition.

The maximum current which could flow through the load resistor would be about 200 multiplied by 1,000 and divided by 300,000, equals 0.67 milliamp. The working plate current would, therefore, be about half this, or about 0.35 milliamp.

Purely as guide, the plate current of a 6J7 is about four times the screen current so that, for the same order of voltage drop, one might expect the screen supply resistor to be about four times the plate supply resistor. In the likely event of the screen voltage needing to

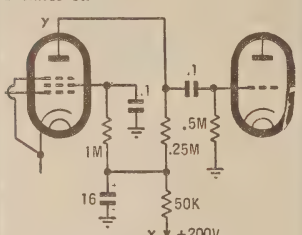
MORE VOLTAGE DROP THAN VOLTS!

Dear Sir,

Please tell me where I am wrong in suddenly realising that the impossible has been happening for years.

The circuit shown herewith seems to me to be a typical one for a 6J7 or similar valve.

Now Ohm's Law says that V equals I times R.



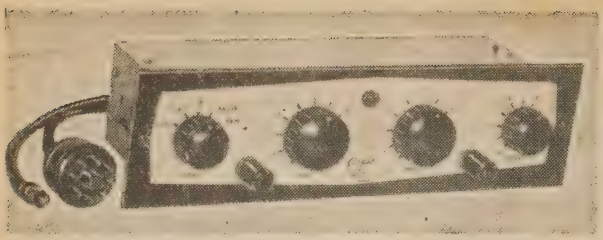
The effective plate resistance is 250K plus 50K, both in parallel with a 500K (assuming the grid leak of the next stage to be in parallel with the load resistor).

Since the plate current of a 6J7 is 2 milliamps, this makes 187K ohms times 2 milliamps, equals 374 volts dropped between points X and Y.

The same applies to the screen: I am well aware that the voltage at Y is not minus 174 volts.

It is probably very simple but I am too dumb to see the answer, unless the average plate current is a long way from that shown in the valve specifications.

Yours Faithfully, R. Y
(Eltham, N.Z.)



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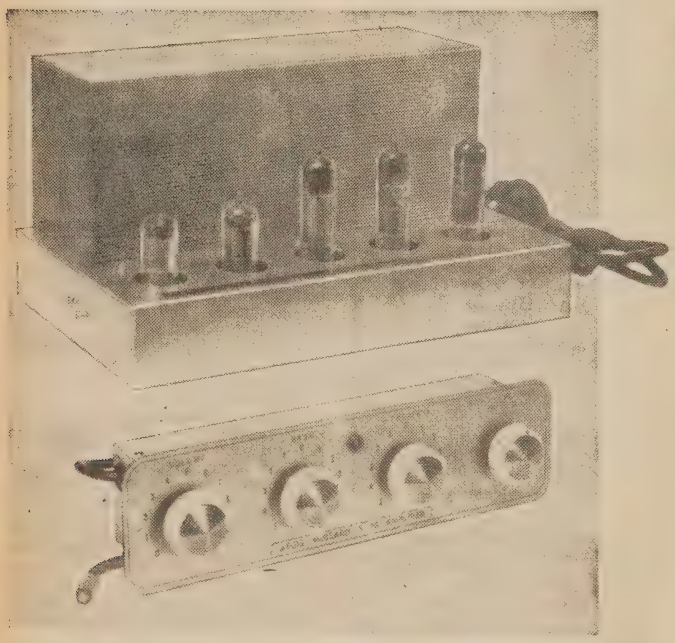

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lower than the plate voltage, the opping resistor would need to be some- at larger again than this.

One could, therefore, expect the screen opping resistor to be 1.0 megohm or gher, the bias resistor being selected to 've about the right order of current in e plate circuit.

And so to the answer to R.Y.'s ques- n—one that should be self-evident by w.

The effective plate voltage in the speci- d circuit is nothing like 250 but is obably well under 100 volts. The reen will likewise be well down, with e inevitable result that operating cur- nts will be nothing like the 2.0 milli- ips and 0.5 milliamp quoted at the ginning of the article. As we said rlier, these figures apply only to a ecific set of operating conditions and t at all to the same valve used as a istance-capacitance coupled amplifier.

RID RESISTOR?

R.Y. needs correction on one other int. He quite wrongly includes the fol- wing grid resistor in his Ohm's Law lculation of plate current and voltage. ie direct plate current (DC plate cur- nt, I mean!) flows only through the coupling and load resistors, so that ly these two should be taken into con- leration, as far as the DC conditions e concerned.

The following grid resistor only comes to the picture when considering the ading for AC or signal conditions. It en becomes part of the circuit by virtue the coupling capacitor.

Two other observations can be added, t so much for R.Y.'s benefit but to mplete the general picture.

One is that valves, as here, do not always draw their full current, as given in general "Class A" conditions.

The total high-tension drain of a re- iver or amplifier cannot therefore be sessed simply by adding together a lot plate and screen current figures. Be- use some may be resistance coupled id others may draw less than maximum rrent by reason of extra or AVC bias, e total current may be a good deal wer than might at first be expected.

The other point is that the actual plate and screen voltage cannot be measured directly with an ordinary voltmeter.

If this latter happens to be set to the 50-volt range, it is nothing more than a 50K resistor and a meter movement in ries. Connecting it between plate and rth produces the same effect as wiring 250K resistor from plate to earth. It mediately produces a voltage divider fect with the plate load resistor and sures that not more than half the sup- y could appear at the plate pin, to be measured," even with the valve with- awn completely from its socket!

TILL LOWER

Switching the meter to the 50-volt ale would reduce its internal resistance 50,000 ohms and to 10,000 ohms on e 10-volt scale.

Imagine how much screen voltage you ould have left, with a voltmeter equiva- nt to a 10,000 ohm resistor strung be- veen the screen pin and earth. It would rtually be a series circuit of a 50K, 1 meg. and a 10K resistor (assuming .Y.'s circuit) across 200 volts. That ould make the meter read a current of about one-fifth of a milliamp, irrespective of whether the tube happened to be plugged in or not.

Read against a 10-volt scale, it would indicate a completely meaningless 2 volts!

Perhaps I should correct that last statement. It isn't completely meaningless. It indicates that the screen voltage is approximately 2, with a 10,000-ohm voltmeter connected between screen and earth. The condition is meaningless, if not the reading.

AS MILLIAMMETER

In the absence of a vacuum tube voltmeter, the only way to assess either plate or screen voltage is to use the instrument as a milliammeter to read plate or screen current. Using these figures, the voltage drop across the supply resistors can be worked out and subtracted from the total HT supply. The remainder must represent the effective voltage which remains at the plate and screen pins.

"Old hands" might be inclined to doubt that many people fall into metering errors of this type, but we can assure you that plenty of readers do so. Time and again we hear from somebody who has set about tracing a fault in a receiver or amplifier, their first "discovery" being that the plate or screen voltage is hopelessly low, reading only so much, "even on the 10-volt range" . . . etc.

It inevitably turns out that the valve concerned is a resistance-coupled audio amplifier, whose plate and screen are fed through high value resistors.

Over and over again we have to explain that there is nothing abnormal about this. That voltages can only be read to any degree of accuracy with a voltmeter, when the internal impedance of the meter is much higher than the impedance of the circuit across which the reading is to be taken.

(I haven't fallen into the trap here of confusing resistance and impedance. By using the latter word, I am merely trying to infer that the remark is true in general for all circuits, involving either direct or alternating voltages.)

As if to strengthen remarks about metering errors, the letter reproduced on this page came to hand much about the same time as the one from R.Y. This too is an "evergreen," as far as our mail basket is concerned and we have long since lost count of the number of readers who have asked precisely the same question for precisely the same reasons.

In our November, 1953, issue, we published the circuit for a power supply unit designed to operate a particular type of battery portable from the power mains. It used a regular 225-volt, 50-milliamp power transformer, a 6X4 rectifier, plus choke, filter capacitor and two dropping resistors, one for the filament, the other for the B-plus supply.

Numerous readers built up this unit and, wary for their precious battery valves, set about to test it before making any connection whatever to the receiver. The unit was therefore switched on and measurements made of the voltage at the relevant supply points to filament and B-plus—with the results encountered by G.P.

MUCH TOO HIGH

The voltage at both points was frighteningly high and seemingly enough to blow the tripe out of the valves. The design, perforce, must be faulty.

But the explanation is really very simple. Resistors are included in both sections of the circuit of a value such that, with the anticipated order of current flow through them, the voltage drop will be sufficient just to leave the required figure at the low potential end. As we said in the article, this should have been about 90 for the B-plus line and about 8 for the filaments.

But the voltage drop across a resistor is strictly proportional to the current flowing through it. If you don't draw significant current, there will be little or no voltage drop and the voltage at both

CIRCUIT A FAILURE SAYS READER

Dear Sir,

I built the AC supply for the "Rambler," in your R. T. & H. issue of November, 1953, exactly as per the circuit.

I used an 225/50 transformer, a choke, a 3,000 ohm 20 watt resistor, a 3,000 ohm 3 watt wire wound resistor, a 24mfd. 350PV and a 500mfd 15PV electro, rectifier a 6X4, wired exactly as per the diagram.

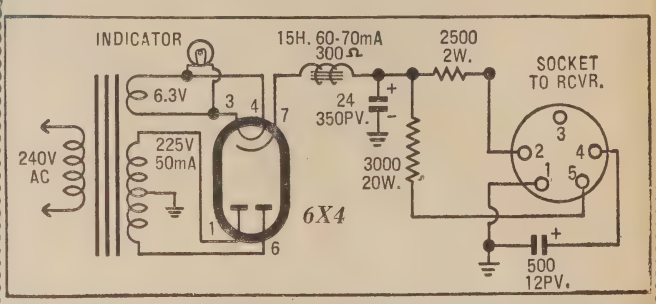
Results: 303 volts on pin 2; 303 volts on pin 5. I built the unit to feed a portable (9 volt battery).

This is the first time over many years using your circuits that I have had a failure. What gives? Perhaps you will kindly advise me.

All the parts test okay, by the way.

Yours Faithfully, G.P.

P.S. Your August issue was excellent and the journal is getting bigger and brighter. Keep the good work going.



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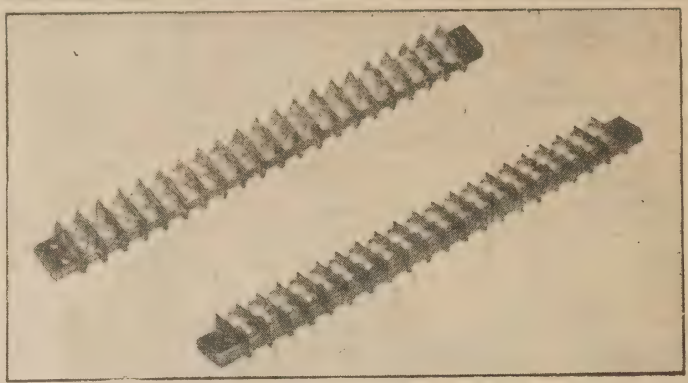

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ls of the resistor will be much the
ne.

n the cases which I have quoted, the
ders have simply connected a meter
robably on the 250-volt range—to the
ls of the resistors in turn.

Allowing for a meter current of about
nilliamp, the voltage drop across the
00 and 3,000 ohm resistors would be
pectively 2.5 and 3 volts, hence the
y high voltages.

Add to this the fact that there would
virtually no drop across the choke
l rectifier and you have the answer
the question "What would an AC
pply of the type shown deliver to pins
nd 5 with a load current approximat-
1 milliamp?"

Unfortunately this isn't the question
which an answer is sought. Rather
t "What would be the voltage at pins
nd 2 assuming a current flow in the
pective supply resistors of 50 and 15
more) milliamps?"

KELY VOLTAGE

The exact design figures for the supply
no longer available but, checking
k, the anticipated output voltage from
6X4 rectifier, with choke input
er, would be 175 volts. Allowing for
voltage drop of about 20 across the
er choke, the filtered HT available
uld be about 155.

Assuming a voltage of 8 or 9 for the
ument string, the filament dropping re-
stor would need to be 147 times 1,000
er 50, equals 2,940 ohms, which is
y close to our suggested value of
00 ohms.

Actually, a few ohms either way
't terribly critical, because the voltage
d current would be more or less self-
mpensating. If the voltage on the fila-
nts tends to fall, the current also falls
d with it, the drop across the supply
sistor.

The HT dropping resistor looks a
tle smaller than expected on the same
neral reasoning but I seem to remem-
r that we allowed for the full permis-
ble voltage on the output valve (normal
ting plus filament bias) since there was
point in striving for economy when
erating from power mains.

HE WRITTEN WORD

The ironic part of it is that the sig-
ficant points were made in brief on
e original article and many of the con-
ructors plainly didn't read it or else
ouldn't believe what was written. We
id and I quote:

"Don't be perturbed if the voltage at
e filament supply point reads very high
ith the set disconnected. It will drop to
s correct voltage under load. For a
ains voltage of 240, the filament sup-
y potential should be about 8 volts."

We then suggested that the safest way
check the unit was to connect every-
ing as intended with the power off,
en clip a 10-volt meter across the fila-
ent circuit and switch on. Watch the
se in heater voltage, we suggested, as
e rectifier warmed up and be ready to
witch off instantly if it looked like
xinging past the 9-volt mark.

These descriptive technical articles are
real problem. If you don't write them,
e space between the pictures looks
orribly blank. If you do write them,
hich is a chore in itself, people don't
ad them.

Woe is us!

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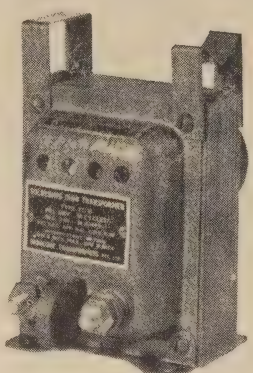

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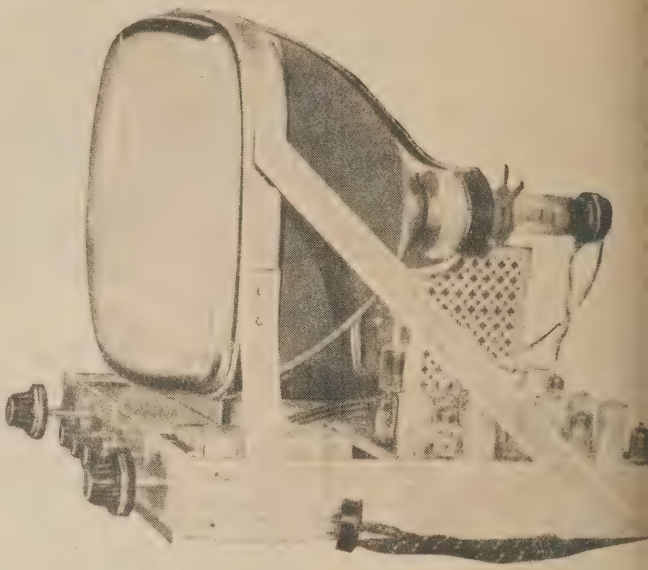

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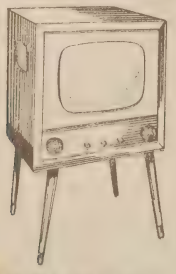

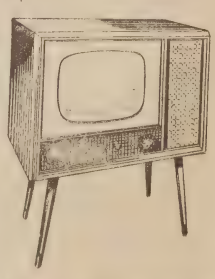

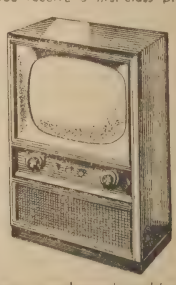

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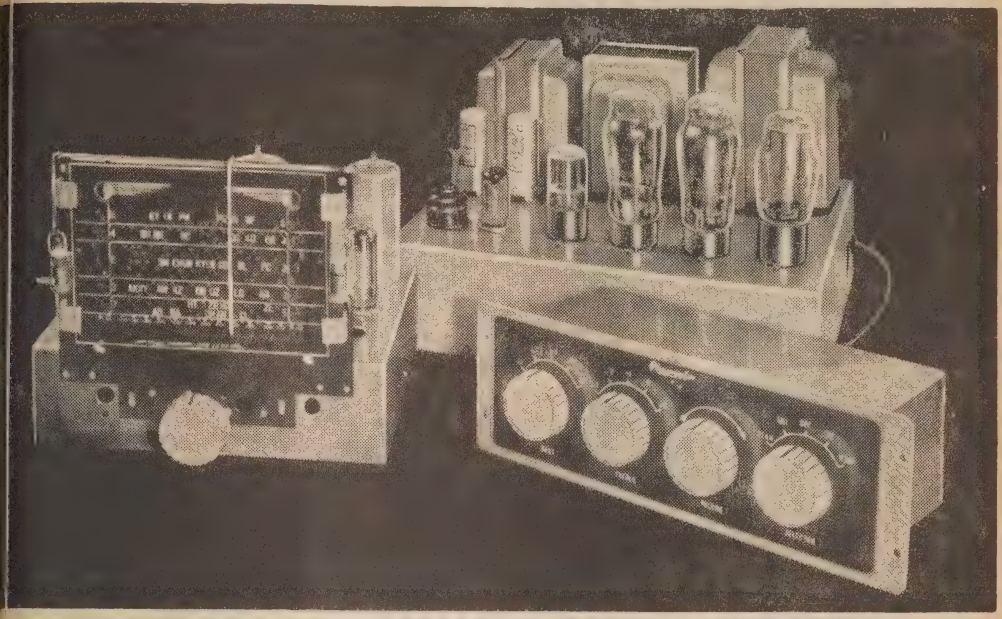

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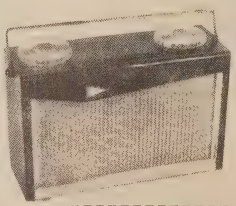

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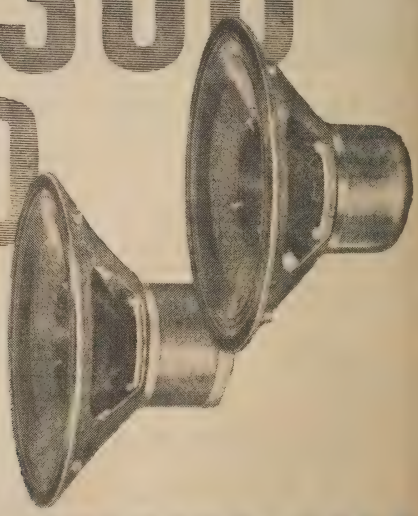

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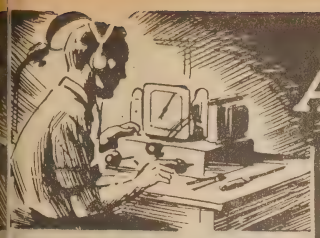
RH/10/58



A READER BUILT IT!

Gadgets and circuits which we have not actually tried out, but published for the general interest of beginners and experimenters.

MODIFYING 28v. GENEMOTORS FOR USE ON 12v.

ligh tension supplies for the operation of receivers, ansmitters and amplifiers from batteries make use f vibrators, genemotors or more lately transistorised C converters. In the normal way all are quite xpensive. Our correspondent suggests a way of odifying inexpensive genemotors to suit normal primary supplies.

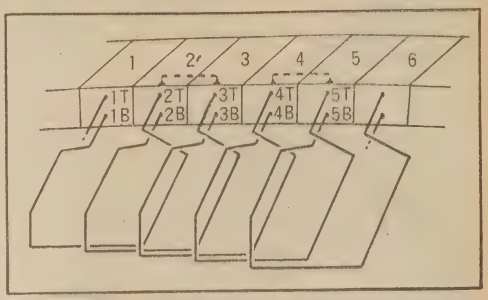
ERE are plenty of 24 and 28 volt genemotors available on the dis- is market but most potential users only 6 or 12 volt supplies avail- It is a relatively simple matter to ert most 24 volt machines for 12 operation and they will then oper- to give half rated output at 6 volts t.

ne current density in the low volt- brushes will be twice as great as nally, but commutation still appears e satisfactory.

RING METHOD

he diagram shows a typical armature fling arrangement looking toward the mutator from the opposite end. The al arrangement should be checked an ohmmeter. Start by unsoldering and soldering it in with 2T. Then allel segments 2 and 3. Unsolder 3T er it in with 4T, then parallel seg- ts 4 and 5. Continue in this fashion around the armature.

is just possible that the order in ch the wires have been placed in the



Basic wiring diagram for the primary commutator, which needs to be modified as described in the text.

commutator slots is not consistent, in which case the easiest way may be to unsolder both wires in each alternate segment. An ohmmeter check will then quickly show which one to resolder and which to shift. Be careful with the fine wires used in the smaller sizes.

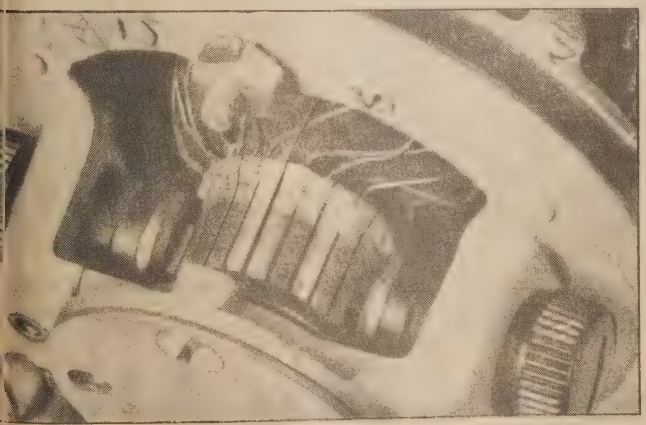
Note that it is only necessary to remove the covering over the top connections at the low tension end of the armature. The alternative bottom connections need not be touched.

The field coils are normally in series, so that it is only a matter of rewiring them in parallel for 12 volt operation.

A check through our own junk box produced a genemotor designed for 28 volts input and to deliver 250 volts at 60 mA. It was of no use in its original condition since the highest convenient supply for our portable equipment is a 12 volt car battery.

When modified as described above it delivered 215 volts under full load indicating that its efficiency had not suffered measurably. With 14 volts input, of course, it would probably have delivered very close to its rated 250 volts.

The entire operation took about three hours including the time taken to remove a brass band around the end of the winding and some bakelite-like material used for sealing but we could probably make a quicker job of the next one. Incidentally a fine scriber pushed into the sealing material a short way helped to loosen it so that it could be cracked off without damaging the fine wires making up the secondary. Care is the watchword.



his close-up view shows the commutator after being rewired and with segments onnected into parallel pairs. A bakelite-like coating has to be carefully picked off the commutator to expose the wires.

AWA RONETTE

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Type TO-284

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Turnover pickup cartridges for standard and long play.

Available in Alternative response characteristics as models OV., P., T., TS., PX.

Newton McLaren

17 LEIGH ST., ADELAIDE

and leading wholesalers

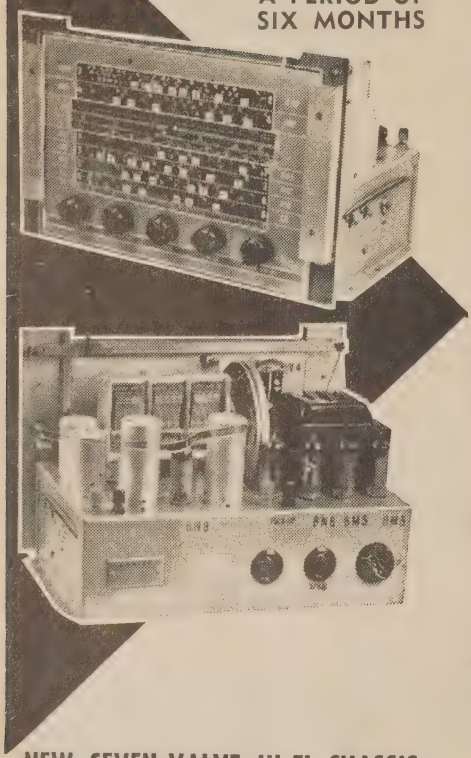
before purchasing your radio see our—

Hi-Fidelity

RANGE

and compare these NEW features.

ALL CHASSIS GUARANTEED FOR A PERIOD OF SIX MONTHS



NEW:

Ultramodern circuit using nine high gain valves including "magic eye" t
indicator. Permatuned iron cored coils and intermediates giving excellent
state reception and a short wave range of 12,000 miles. All valves use
the new Mullard nine pin Innoval series.

NEW:

Ton control and audio stages incorporating the Mullard 5/10 amplifier c
with separate bass and treble controls giving plus or minus 15 db boost o
at 50 cycles L.F. and 10,000 H.F., combined with push-pull output with in
feed-back gives you really high fidelity reproduction from your radio or fav
recordings.

NEW:

Dual Speaker combination, using a heavy duty woofer (12in M.S.P. Jensen
special) with matching 6in tweeter and cross-over network giving a freq
response of 46 to 13,000 cycles. Speakers are mounted coaxially making
one 11in mounting hole necessary.

NEW:

If required the new Magnavox high-fidelity twin coned speaker can be sup
Large calibrated edge-lit dial in plate glass (11in x 7in) with main station
each State in prominent type. Dial fitted with counterweight drive, giving sm
tuning. Indicator lights are fitted showing which band is in operation
can be supplied in cream, black or brown with matching knobs and escut
to suit contemporary blond or walnut finished cabinets.

NEW:

Sensitive "magic eye" tuning indicator (EM80) making tuning simple and po
even on interstate, overseas and country stations.
All chassis are wired for the fitting of F.M. tuner or tape recorder, sp
plug being provided on back of chassis, also pick-up terminals and outle
gramo motor.
Power switch is fitted to volume control, radiogram switch, combined with
change switch. Audio end of set can be used with TV receiver if require

A NINE VALVE HIGH-FIDELITY RADIOGRAM CHASSIS

Nine and ten valve chassis incorporate the Mullard 5-10 AMPLIFIER CIRCUIT Frequency response 40-13,000 cycles Max output 10 watts.

£41/15/

F.O.R.

A NEW 10 VALVE DUAL WAVE RADIOGRAM CHASSIS

WITH BASS AND TREBLE BOOST

The ideal chassis for those difficult locations where reception is doubtful. Specifications are nine valve unit, but with the addition of high gain tuned R.F. stage giving greater sensitivity and selectivity on both broadcast and short wave bands.

£44/15/

F.O.R.

NEW SEVEN-VALVE HI-FI CHASSIS

This new compact dual wave seven valve chassis uses the same tuner circuit as our 9-valve unit with the Mullard tone-control circuit giving separate bass and treble controls. Push-bull output using two of the new 6BM8 dual purpose output valves and heavy duty M.S.P. speaker.

£31/15/- F.O.R. PACKING 10/- EXTRA.

Also available with Magnavox 12W.R. Hi-Fi speaker and Ferguson output transformer at £4/15/- extra.

Write for full specifications

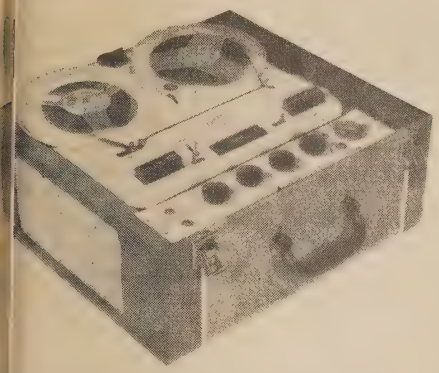
ALL 4 SPEED RECORD CHANGERS AND PLAYERS STOCKED

Classic Radio

245 PARRAMATTA ROAD, HABERFIELD, N.S.W. PHONE UA2145

Buying a Tape Recorder?

st see and hear the new Hi-Fi Recorder by Classic incorporating the ew Collaro Mark IV Transcription deck. The only deck with ALL these features.



COMPLETE UNIT IS SUPPLIED IN TRACTIVE AND DURABLE TWO-TONE STIC COVERED CASE COMPLETE WITH ACOS MICROPHONE

six-valve amplifier incorporates the latest "Mullard" recorder circuit equalised to C.C.R. standards giving t reproduction from recorded tapes. Record monitor- nd outlet to power amplifier. Extension speaker out- nd "magic eye" level indicator. Amplifier is com- y shielded and fitted with perspex dress plate to match

- **HIGH FIDELITY**
Heads are double coil wound and will reproduce up to 12,000 c.p.s. at 7½ inches per second. Azimuth adjustments on both impedance "record" and "playback" heads. Output of heads is approximately 5 milli-volts at 1 Kc at 7½ inches per second.
- **INSTANTLY REVERSIBLE**
Instantaneous changes can be made from one track to the other. Fast rewind in either direction.
- **CONSTANT TAPE TENSION**
A special Collaro device ensures a constant tension on the tape on the take-up spool as it leaves the capstan.
- **FULLY MECHANICAL**
No solenoids are used in the construction of this Transcriptor. The braking is entirely mechanical.
- **FINISH**
Cream Polystrene cover plate with maroon controls.
- **THREE SPEEDS**
3¾, 7½ and 15 inches per second.
- **FOUR HEADS**
Two "Record/Play-back" and two "Erase" heads are sited on two different levels and head wear thus halves for any given length of track.
- **TWIN TRACK OPERATION**
One pair of heads for each track. Both top and bottom tracks can be recorded or played back without removing tape.
- **PAUSE CONTROL**
This has the effect of stopping the transit of the tape past the "Record/Playback" and "Erase" heads and applying the brakes to the spools while leaving all switches and mechanical functions in their selected positions. Typical application is to pause whilst recording to omit speech interposed between musical selections. Control will only work whilst it is held in position.
- **TAPE MEASURING & CALIBRATING DEVICE**
The three digit counter makes the location of any recorded passage the simplest of operations.
- **TRANSCRIPTION TECHNIQUE**
A large diameter flywheel with ground and lapped steelshaft running on a ball at the bottom of long bearing reduces friction and virtually eliminates "wow" and flutter at less than 0.15 to 1.0 per cent.
- **TWO MOTORS**
Each dynamically balanced motor does only one job at a time. Motors never act against each other and are of low wattage input with consequent reduction in heat and wear.

COMPLETE RECORDER WITH MIKE — 80 GNS. f.o.r.

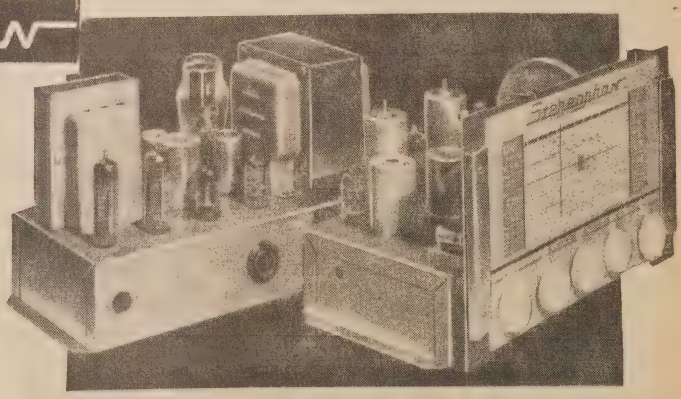
DECK WITH AMPLIFIER, POWER SUPPLY and 6in x 9in SPEAKER, 70 GNS.

Stereophon

— LIVING SOUND —

compact 11-Valve h-grade Radio- n in two chassis uring a variable d - width Tuner, ti-input preampli- and Tone Con- in one unit and)-Watt Ultra-linear plifier. Ideally ed for use with h-grade pick - ups speakers.

65 GNS. F.O.R.



Classic Radio

245 PARRAMATTA ROAD, HABERFIELD, N.S.W. PHONE UA2145

The WARBURTON FRANKI Page

Check it each month for all your Radio & TV needs!

STEREOPHONIC SOUND
W.F. for the latest and best Stereophonic Cartridges — Amplifiers, Pick-ups.
Full Details on Request

HIGH QUALITY AMPLIFIER YOU CAN AFFORD The W.F 4 watt A plifier will give superb reproduction from any of the popular pick-ups. An output tra former to suit speakers from 2 to 4 ohms, or 15 ohms impedance is built in Ple specify impedance required.
PRICE — complete ready to use **£16/19/6.** Freight Vic. 2/9; Int. 6/-, or complete set to build your own — 14 gns. Freight Vic. 2/9; Int. 6/-.

HI-FI RECORD PLAYING EQUIPMENT 31gns
Complete set ready to install in your own cabinet
Consisting of the W.F. 4 watt Amplifier, B.S.R., TU9 4-speed player and pick-up, Magnavox 12WR wide range 12in Speaker. Purchased separately would cost £35/19/1 FREIGHT FORWARD

METERS First quality 4in square meters 0-1 m.a. with plain multimeter scale
100 ohms resistance 95/- plus 12½ per cent tax.
also 0-500 micro-amps 95/- plus 12½ per cent tax.
0-50 micro-amps 135/- plus 12½ per cent tax.
Post Vic. 1/-; Int. 2/6.
1 m.a. meter rectifiers 12/6 plus tax. Post free.

BUILD THE Q+ 21" TV SET
Complete including Picture Tube £129/19/-
As above but 17in tube £119/19/-
Freight Forward

SOLDER THE EASY WAY WITH SCOPE SOLDERING IR
heats in a few seconds from transformer or car battery Spare parts always in stock
Scope Iron 50/-. Post Vic. 1/-; Int. 2/6. Spare Tips 10d each.
Transformer to suit 47/11. Post Vic. 2/-; Int. 3/8. Spare Carbon Elements 1/- each

PRONTO SOLDER GUN Hold in the hand like a revolver Inbuilt Transformer uses piece of Tinned Copper Wire as bit Nothin wear or burn out. £5/4/-.

SUPERIOR SOLDERING IRONS
40 watt 29/-. Post. Vic. 1/4; Int. 3/-.
60 watt 37/6. Post. Vic. 1/4; Int. 3/-.
80 watt 42/6. Post. Vic. 1/4; Int. 3/-.

SOLDER 1lb reels 16 gauge Resin Cored Radio Quality 40/60 12/7.; TV Quality 60/40 15/4 Post age. Vic. 1/4; Int. 3/-

CHASSIS PUNCHES Hammer type guaranteed A1. None better or cheaper.

	Post Vic.	Int.
⅛in 20/-	6d	6d
5/8in 20/-	6d.	6d.
¾in 23/4	6d.	6d.
1in 30/-	1/4	3/
1 3/16in 33/4	1/4	3/-

BARGAINS

TELEVISION POWER TRANSFORMERS 230-0-230V at 350 m.a.; 6.3V 6A; 6.3V at 6A £6/19/6. Post Vic. 2/3; Int. 3/8.
X61 Valves — mixer type can be used as replacement for 6J8, 6A8 etc. 18/ each.
1R5, 1T4, 1S5 Valves, 12/6 each. (Valves are new and cartoned.) Post.
HI-FI OUTPUT TRANSFORMERS. 30 minus 12KC plus or minus 1DB watts.
Primary — 10,000 ohms P.P. Secondary — 200 or 50 ohms. 29/11 eac Post. Vic. 2/3; Int. 3/8.
GEXOO DIODES for detectors in crystal sets, 4/11 each. Post Free.
DUAL CONCENTRIC SPEAKERS, 12in woofer with a Co-axially mount tweeter. 35-15,000 c.p.s. — 15 ohms Impedance.
Power Output — 20 watt 16 gns. Freight Forward

MAGNAVOX STANDARD RANGE SPEAKERS

MODEL	12P1	12P2	10P1	10P2	8P1
Overall Diameter	12¼in	12¼in	10 1/8in	10 1/8in	8 3/16in
Baffle Opening	11in	11in	8 7/8in	8 7/8in	7 1/8in
Voice Coil Diameter	1in	1in	1in	1in	1in
Voice Coil Impedance Ohms at 400 C.P.S	2.7	2.7	2.7	2.7	2.7
Cone Resonance Range C.P.S	45-75	45-75	80	80	95-130
Power Handling Capacity — Watts	10	10	8	8	7
Retail Price	81/-	66/-	75/6	64/1	53/
VIC	2/11	2/11	2/11	2/11	2/3
POST. INT	4/4	4/4	4/4	4/4	3/8

MODEL	8P2	6P1	6P2	5P5
Overall Diameter	8 3/16in	6½in	6½in	5¼in
Baffle Opening	7 1/8in	5 9/16in	5 9/16in	4 13/16in
Voice Coil Diameter	1in	1in	1in	¾in
Voice Coil Impedance Ohms at 400 C.P.S	2.7	2.7	2.7	2.7
Cone Resonance Range C.P.S	95-130	80-120	80-120	135
Power Handling Capacity — Watts	7	6	6	4
Retail Price	52/6	58/6	51/5	42/6
POST VIC.	2/3	1/10	1/10	1/10
INT.	3/8	3/-	3/-	3/-

MAGNAVOX WIDE-RANGE SPEAKERS

MODEL	HF5	6WR	8WR	12WR
Overall Diameter	5¼in	6½in	8-3/16in	12¼in
Baffle Opening	4-13/16in	5-9/16in	7 1/8in	11in
Voice Coil Diameter	¾in	1in	1in	1in
Voice Coil Impedance	2.7 ohms	2.7 ohms	2.7 ohms	2.7 ohm
Cone Resonance	130-C.P.S.	45-C.P.S.	45-C.P.S.	45-C.P.S
Frequency Range	130-10K	30-15K	30-15K	40-15K
Power Handling Capacity	4 Watts	6 Watts	7 Watts	10 Watt
Retail Price	55/11	£6/10/	£7/-/-	£7/9/7
POST VIC.	1/10	1/10	2/3	2/11
INT.	3/-	3/-	3/8	4/4

Replacement Cone Heads are available for all Magnavox Speaker

TOP QUALITY CIRCUIT TESTERS AT TOP VALUE PRICES.

MODEL TK30-A 4in x 2¼in x 1 3/8". A midget size individual jack type circuit tester with a colour plastic panel and cabinet.
D.C Volts: 15/150/750V (1000 ohms/V).
A.C. Volts: 15/150/750V (1000 ohms/V)
D.C Current: 150 mA.
Resistance: 100 K ohm (By 1.5V internal battery) £5/15/-.

MODEL TK-50. 4¼in x 3¼in x 1¼in. A pocket size individual jack type circuit tester with an insulated panel and steel cabinet.
D.C. Volts: 10/250/500/1000V (1000 ohm/V)
A.C. Volts: 10/250/500/1000V (1000 ohm/V)
D.C. Current: 1/250 mA
Resistance: 10/100 K ohm (By 1.5V internal battery) £8/19/6

MODEL TK-70. 5in x 3½in x 1¼in. A pocket size ro switch type circuit tester with an insulated panel and cabinet.
D.C. Volts: 10/50/250/500/1000V (2000 ohm/V)
A.C. Volts: 10/50/250/500/1000V (2000 ohm/V)
D.C. Current: 500u A/25/500mA
Resistance: 10K ohm/1 Mg. ohm (By 3V internal battery).
Decibels: minus 20 to plus 22db; plus 20 to plus 36db **£12/15/-.**

MODEL TK-90. 6in x 4in x 2¼in. A handy size ro switch type circuit tester with a black bakelite panel cabinet, having a high sensitivity 45 uA meter 20,000 per volts on DC and 8,000 ohms per volts on A.C.
D.C. Volts: 10/50/250/500/1000V (20,000 ohms/V)
A.C. volts: 10/50/250/500/1000V (8000 ohm/V)
D.C. Current: 50uA/2.5/25/250 mA
Resistance: 5/50/500 K. ohm/5MG ohm (By 3V internal battery)
Decibels: minus 20 to plus 5db (0db. minus 0775V minus 600 plus 5 to plus 22db **£15/15/-.**

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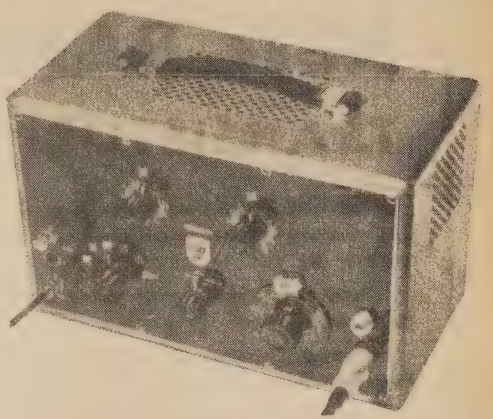
TRADE REVIEWS AND RELEASES

PHILIPS TV GENERATOR IS VALUABLE INSTRUMENT

e Philips Television Service Generator pictured the right is one of the most useful instruments have had for some time for test in our laboratory. would be an invaluable aid to anyone engaged in e development or servicing of television receivers.



Carrier output frequency is adjusted by the controls at lower centre and right. Function selector is at the lower left, while the knobs at the top adjust the number of horizontal and vertical bars.

E instrument is designed basically to provide a standard television test l, complete with frame and line ronising pulses, a variety of video ulation patterns and an FM sound l to suit intercarrier receivers. It fore renders the laboratory inndent of radiated test patterns and s picture linearity to be adjusted e best possible accuracy.

r this purpose, it will provide either ontal or vertical bars, adjustable in ber, or a combination of both to uce a cross-hatch pattern. Picture rity can be judged accurately by paring spacing between adjacent bars calipers.

e found the vertical bar pattern most il also for observing ringing effects. this end, the pattern can be fed igh the video amplifier alone, igh the IF channel at 3.6 Mc or plete receiver on any desired chanprogram.

parate output sockets allow two rs of RF output level to be selected, at the performance of the receiver can be observed on strong or weaker signals.

An examination of the circuit reveals the use of 11 double purpose valves, plus rectifier, neon synch, tube and a germanium diode. The number of valve functions is an indication of the trouble to which the designers have gone to achieve a close approximation of a standard television signal.

The one noticeable and perhaps necessary exception is that the scanning is not interlaced.

Different versions of the instrument are available for different transmission standards, type GM2891/55 being the one intended for use in Australia.

The instrument is supplied complete with all cables and a detailed manual explaining its design and application to TV Testing.

Transformers for "Transporta Six"

MPLES of well-finished transformers suitable for our transistor portable iver described in the August issue been received from Ferguson Transhers Pty. Ltd., of Ferguson Lane, tswood, N.S.W.

he driver transformer has the type ber TRD108 and the output transer TRS109. Both use a lamination

a ¼in centre lug and are designed it the printed wiring board.

ested in our laboratory model, the sformers proved to have excellent uency response and efficiency. There no sign of oscillation at the exes of the range with the specified unt of negative feedback, phasing acitor, etc.

MINIATURE ELECTROS FROM U.C.C.

Full advantage of transistors and miniature valves, from the point of view of space saving, can only be taken if suitable resistors, capacitors, transformers etc. are available to go with them. Low voltage high value capacitors in miniature size are particularly important in transistor circuits because of the low impedance circuits involved.

A FEW samples from a recent release by the United Capacitor Co., of 433 Punchbowl Road, Enfield, are illustrated here. The full range includes 40 different types. The smallest size is ⅛in

diameter by ⅝in long giving a range from 4 uF at 3 volts working to 0.5 uF at 50 volts working. At the other end of the scale, a capacitor ⅝in diameter and 1in long is available in various types from 150 uF to 25 uF the latter at 50 volts working.

The capacitors are manufactured to a design which originated with the Telegraph Condenser Co., of the United Kingdom, and incorporating a patent method of sealing in which the capacitor elements are hermetically sealed in aluminium tubes with rubber rings. Each capacitor is insulated with a PVC sleeve to prevent shorts to the aluminium tube.

The capacity tolerance is plus 100 per cent and minus 20 per cent. The manufacturers state that the leakage current will not exceed 0.5V times the square root of C expressed in microamperes. The surge voltage rating is 50 per cent above the working voltage.

FERGUSON

NEW RANGE

TRANSISTOR TRANSFORMERS

FERGUSON now offer a new range of TRANSISTOR DRIVER and OUTPUT TRANSFORMERS designed to meet requirements by manufacturers and home builders of equipment using currently available low-power transistors.

These transformers feature sturdy cadmium-plated steel wrap-over brackets, firmly crimped to the core. Tabs on the bracket are firmly crimped under the core, providing a rigid assembly.

Standard types are fitted with mounting feet, but can be supplied to special order with through-chassis mounting lugs.

Leads are firmly anchored, and the entire assembly is thoroughly wax impregnated.

NEW FERGUSON TRANSISTOR TRANSFORMERS

TYPE No.	APPLI-CATION	NOM. IMP.—OHMS PRIM.	NOM. IMP.—OHMS SEC.	NOM. POWER	REPLACES TYPE	DIMENSIONS—INCHES ALL TYPES
TRD107	DRIVER	3000	1300 C.T.	—	MT236	HEIGHT 1-11/32
TRD108	DRIVER	3000	2000 C.T.	—	MT355	WIDTH 1-1/16
TRS107	OUTPUT	420 C.T.	3.5	500 mW	OP306	LENGTH 1-19/32
TRS108	OUTPUT	300 C.T.	3.5	500 mW	OP370	MTG. CENTRES 2-1/16
TRS109	OUTPUT	375 C.T.	3.5	500 mW	—	MTG. HOLES 0.136 dia.

TYPICAL APPLICATIONS

EQUIPMENT	DRIVER	OUTPUT
TELEPHONE AMPLIFIER—R.T. & H. APRIL, 1958	TRD 108	TRS 108
INTERCOM. AMPLIFIER—R.T. & H. JUNE, 1958	TRD 108	TRS 108
TRANSPORTA SIX—R.T. & H. AUGUST, 1958	TRD 108	TRS 109
RCS TRANSISTOR PORTABLE RECEIVER	TRD 108	TRS 109
RCS TRANSISTOR PORTABLE WITH RCA TRANSISTORS	TRD 107	TRS 108

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MELBOURNE—McKINNON NICHOLLS PTY. LTD., 468 Collins St. MB1501

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ADELAIDE—TYQUIN LTD., 11 Pitt St. LA4075

PERTH—ATHOL M. HILL, Durham House, 842 Hay St. B6500

IGH CURRENT ECTIFIER OA31

HIGH current germanium rectifier recently released by Philips Electrindustries P/L has a maximum forcurrent rating of 12 amperes, a inverse voltage rating of 85 volts can be used, at reduced ratings, at eratures up to 75 degrees centigrade. is anticipated that rectifiers of this will find application in light com-

battery chargers. For example, a e OA31 would easily be able to ge a 12 volt battery at the 3 eres which is considered an effective e for a home charger.

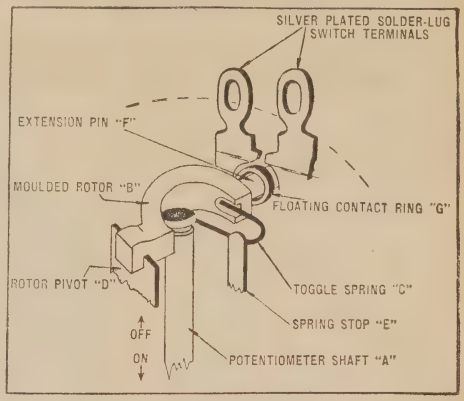
he size of the rectifier can be judged the accompanying heat sink which in in diameter. Retail price is 19/7 including tax.

ECTRONIC EXECUTIVE O TRAVEL OVERSEAS

R MAXWELL WALKER, Managing director of International Resistance lings Ltd. and its operating subsidiarexpects his present four months' of the United States, Canada, Engand Europe to gain him much inmation on the latest developments he electronic components field.

PUSH-PULL SWITCH ON DUCON POTS

Samples from a comprehensive range of carbon potentiometers have been received from Ducon Condenser Ltd., of Christina Road and Birmingham Avenue, Villawood, N.S.W. Readers will be particularly interested in types which include a push-pull rather than a rotary switch mechanism.



THE rotary type switch mechanism has the disadvantages that there is unnecessary wear on the carbon track each time the mechanism is switched on and off and also that it is difficult to return exactly to the previous setting, a feature which can be frustrating when a long warm-up time is involved as, for example, in the case of some television receivers.

The switch mechanism is available either as a type designed to break 2-amp 250-volt circuits actuated by a pressure of 8oz or an 8-amp 12-volt type actuated by a pressure of 20oz. The former is specially applicable to small radio receivers and the latter to larger equipments and car radio receivers.

All push-pull line switches pass a voltage test of 1,000 volts RMS between terminals and the potentiometer body and also between switch terminals with the switch in the "off" position.

The drawing shows the essentials of the switch mechanism. When the shaft (A) is pushed or pulled it actuates the moulded rotor (B) through the semi-rotating toggle spring (C). The rotor is pivoted at one end (D) and is held in either the on or off position by the spring (C), which is itself retained in the operating position by stop (E). The free end of the rotor carries a moulded extension pin (F) on which floats the silver-plated alloy contact ring (G).

A good feature of this construction is that the contact ring is allowed to rotate each time the switch is actuated, resulting in a new or different contact surface each time the switch is turned on.

A wide range of resistance values, tapers, tappings, shaft sizes and lugs is available.

The prices, not including tax, are 10/3 for a single pot, with a push-pull SPST switch, and 20/8 for a dual-concentric pot. with push-pull SPST switch.

Projection lamps last longer

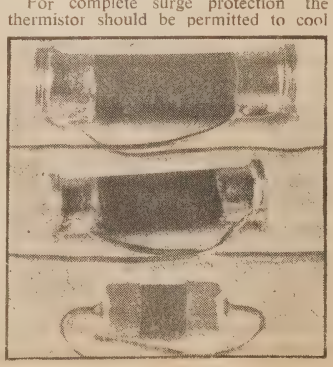
arly failure of lamps used in slide and movie projectors can often be ttributed to the high surge current which flows when the power is rst switched on. At room temperature, the resistance of the filament ay be only a few ohms and it is a fraction of a second before it assumes the normal value.

ANDARD TELEPHONES AND CABLES PTY. LTD., of 252 ny Road, Alexandria, N.S.W., have sed a series of thermistors designed rotect standard 240-volt projection s. The thermistor is placed in series lamp and, when cold, presents an eciable resistance limiting the peak ent at the instant of closing the cir-

owever, as the temperature of the mistor rises due to the series cur- its resistance decreases. It is pos- to choose a unit which has negli- resistance at normal operating cur-

he body temperature of the thermus- may be as high as 250 degrees C, it is important to see that it is placed away from other components likely be damaged by high temperatures . it should not be cooled by a fan e it will then not reach its maximum temperature and full lamp brilliance will not be reached.

For complete surge protection the thermistor should be permitted to cool



for at least 10 minutes before being switched on again, but even without this precaution the surge cannot be greater than it would have been without the thermistor.

Type CZ9A has a maximum continuous current rating of 1.0 ampere, a cold resistance of 350 ohms and a maximum current resistance of 3.7 ohms. It is suitable for use with a 150 watt lamp and the retail price is 2/11.

The CZ11 is suitable for 250 watt or 300 watt 240-volt lamps or a 150 watt 110-volt lamp. Its maximum current rating is 1.5A, hot resistance 140 ohms, cold resistance 2.5 ohms and price 5/3.

Similarly the CZ12 is rated at 2.5A for a 500 watt lamp, its cold resistance is 120 ohms, hot resistance 1.5 ohms and price 6/8.

A CZ11 was fitted to a 300 watt projector belonging to a staff member, care being taken to place it out of the draught of the cooling fan, and in a position where the heat from the thermistor would not damage other components.

Checks indicated that most of the mains voltage was developed across the thermistor at the instant of switching on. Within a few seconds the drop had fallen 4 volts. Change in lamp intensity and colour temperature with the thermistor shorted out were negligible.

A COURSE IN TELEVISIO

PART 31—SAWTOOTH OSCILLATORS (Cont.)

In this instalment, we continue with the discussion of typical blocking oscillator circuits, the show a method by which they are commonly adapted for automatic frequency control.

FIGURE 171 shows the circuit details of the frame-blocking oscillator used in current R., TV and H. television receivers. It differs from the basic circuit of figure 169 in two important respects.

In the first place, the feedback transformer is connected in the grid-cathode circuit, as for any ordinary cathode-coupled oscillator.

The second point of difference follows naturally, in that concentration of the feedback components in the grid-cathode circuit frees the plate circuit to carry only the sawtooth and output components. Much of the advantage of the pentode arrangement is therefore realised without the complication of an additional electrode.

POSSIBLE ADVANTAGE

The arrangement has a special advantage in the case where the functions of frame oscillator and output are to be concentrated in one valve envelope. In such a case, it is highly likely that only a triode will be available for the oscillator function.

In figure 171, the basic grid circuit components are the .0068 mfd. capacitor, the 1.2 megohm resistor and the 1.0 megohm potentiometer. This last provides a means for varying the time constant of the grid circuit, and therefore the blocking frequency, serving as the "Frame Hold" control.

When set for normal picture hold, the natural frequency of the oscillator would be a little lower than 50cps, being, therefore, triggered on each cycle by the incoming frame pulse.

Were it not for the need to inject this frame pulse, the potentiometer and one side of the .0068 mfd. capacitor would connect directly to earth. However, to provide a pulse injection point, the return is made through a relatively low value of resistor (22K), bypassed by a .0047 mfd. capacitor.

The incoming synch. pulses are fed to the junction via a 0.1 mfd. blocking capacitor and an 82K resistor, the main function of the latter being simply to isolate the synch. separator and the blocking grid circuit. In so doing, it attenuates the available synch. pulse, but this is allowed for by designing the separator to deliver a very high initial frame pulse voltage.

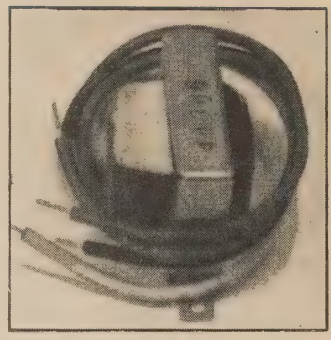


Figure 172: A typical blocking oscillator transformer, as used in R., TV and H. receivers. It is about the size of a small loudspeaker output transformer.

As mentioned last month, the feedback transformer must be designed for the job, and in practice is rather similar in appearance to a small loudspeaker output transformer. (See figure 172.)

The 82K resistor, shown in parallel with it, is included in the circuit to limit the natural "Q" of the winding.

Operation of the circuit is along similar lines to that already outlined for figure 169 last month.

Assume that the grid and plate reach potentials such that the valve just begins to conduct. The rising plate current is evident also as a rise in cathode current and, because of the transformer phasing, it impresses a positive-going signal voltage on the grid.

The positive-going grid signal accelerates the rise in plate and cathode current in cumulative fashion. However, the grid itself is prevented by grid rent from rising too far above ca potential much of the positive-g signal energy is absorbed as a char the .0068 mfd. grid coupling capa

The action can continue only plate current saturation is reache which point the rise in grid voltage cease. With the plate current statio the positive-going signal at the grid not be sustained and the grid si reverts to a potential determined by charge which has been built up a the .0068 mfd. capacitor.

This, in respect to earth, makes grid highly negative and well beyon potential necessary for plate current off. The plate current remains cu for as long as it takes the charge in capacitor to leak away through the megohm resistor and the Frame potentiometer.

When the grid potential does again rise above cut-off, plate cathode current immediately begi flow once more and the whole cyc events is repeated.

While the plate current is cut off .047 mfd. capacitor charges toward H.T. supply voltage through the megohm resistor and the 2.5 meg potentiometer. When the valve cond it draws energy from the capacitor, t fore discharging it, at least partially.

CAPACITOR VALUE

The choice of the capacitor valu a definite compromise, as explaine earlier discussion. If it is made larg value it receives only a small propo of the total possible charge during period when the valve is not conduc The difference in voltage between charged and discharged condition therefore comparatively small, altho the charging law is substantially line

Reducing the value of capacitor al a greater voltage to be developed with poorer linearity, since the sawt waveform now includes a greater portion of the total charging curve.

The relationship of output and lin ity is influenced also by the amoun resistance in the plate load circuit. Figure 171 the capacitor is fixed at but the resistance is variable by v of the 2.5 megohm potentiometer. practice the order of these compon and their range of adjustment is set r than anything by the need to develop the right amount of signal drive to grid of the frame output stage.

Because it is an amplitude control 2.5 megohm potentiometer can wel branded "height control." Howeve also affects linearity, both directly its effect on the oscillator and by v of the drive to the output stage in tion to bias. It has to be manipul

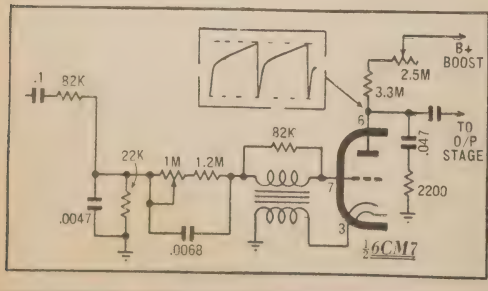


Figure 171: A typical frame oscillator circuit, as used in R., TV and H. receivers. Point of note is that the feedback transformer is in the grid-cathode circuit, leaving the plate free to carry the sawtooth and output components.

efore, with an eye to picture linearity
uch as to picture height.
ecause the sawtooth capacitor and
HT supply resistors vary the level
h the charge voltage reaches during
cycle, they also affect slightly the
t at which conduction recommences.
re is, therefore, some slight inter-
ing between the sawtooth amplitude
frequency control, although within
normal range of adjustment for each,
effect may be small enough to pass
oticed.
is noteworthy that the plate circuit
own returned to B-plus boost, rather
to the normal HT supply line. This
st voltage is normally available more
ess as a "by-product" of the damper
le in the line output and EHT circuit.
usually of the order of 500 volts.

TER LINEARITY

y supplying the charging circuit from
boosted voltage, better linearity can
obtained for a given sawtooth ampli-
e.
n many receivers, the frame output
e is also supplied from this same
sted source. The scheme is only prac-
ble, however, where the design of the
output circuit allows for the requisite
er of drain, which may amount to
odd milliamps for the two stages.
One other point of note is the in-
sion of a small value resistor in series
h the .047 mfd. charging capacitor.
re is a large instantaneous drop in
tage across this when the oscillator
ins to conduct, which is superimposed
a sharp spike on the normal sawtooth
put waveform. This is shown in
re 171.
Presence of the spike has a bearing
the flyback and linearity characteris-
of the frame output stage, also on
peak energy fed back to the grid
ing conduction. In many cases, its
lusion or value is not highly critical
respect to its primary function.
In point of fact, however, the resistor
be significant in a secondary and
her surprising way. Line energy from
deflection yoke can find its way by
pacitance back through the frame out-
t stage to the plate of the frame oscil-
or and possibly from thence to the
d.
In either circuit it can influence the
act triggering point of the frame oscil-
or sufficiently to prejudice interlace or,
rse still, to cause frame jitter.
Though intended primarily as a saw-
oth capacitor, the .047 mfd. from the
me oscillator plate to earth effectively
passes stray line energy to combat the
wanted effects just mentioned. The
ries resistor reduces it effectiveness in
is regard, and should therefore be kept
small as practicable.

FC SELDOM USED

While it would be possible to apply
me form of automatic frequency con-
ol to a frame oscillator, this is not
ually done. The reason is that the
ame synch. information is of relatively
ng duration and is passed to the grid
rcuit through an integrating network.
his allows a single large pulse to build
from a deliberate succession of
naller ones, but it substantially elimin-
es short, individual pulses.
The frame oscillator is therefore rea-
nably proof against random electrical
noise pulses. The same is not true, however, of the line oscillator, and all modern receivers use some form of automatic frequency control in conjunction with it.

Figure 173 shows the circuit of a typical line-blocking oscillator, again extracted from the R., TV and H. television receiver.

In this case a Hartley-type oscillator circuit is used with a single, tapped inductor bridging between grid and plate.

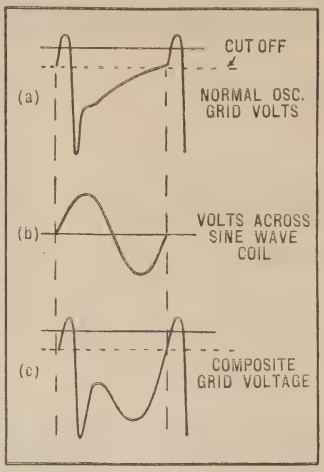
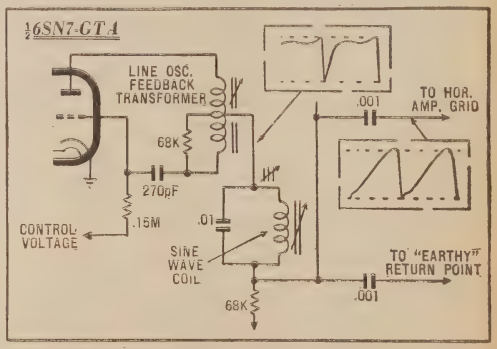


Figure 174: These waveform sketches illustrate the effect of superimposing a sine wave (b) on the natural grid waveshape (a) of a blocking oscillator. Note that the grid now approaches the cut-off line much more steeply, being thus less open to random triggering by noise, etc.

Figure 173: Here is a typical line blocking oscillator circuit, with feedback between grid and plate and with a stabilising coil in the common return. Blocking frequency is affected by the core setting of the feedback transformer but it can also be controlled by the potential applied to the grid return resistor.



The cathode is earthed, while a capacitor and resistor isolate the grid circuit from the B-plus supply voltage.

The feedback transformer in this case is a honeycomb-wound unit with a variable iron dust slug wound in the fashion of a radio frequency inductor. It could, in fact, be classified as such, since its natural resonant period must be very small with respect to the 15,625 Kc line frequency.

If conventional circuitry were to be followed the tapping of this coil would be connected directly to a B-plus supply point, while the grid resistor would return to earth. Although the circuit could certainly be made to operate this way it is not so arranged and both aspects require further explanation.

In the first place, the tapping on the feedback transformer is connected to its B-plus supply point through an additional component, commonly referred to as a "sine wave coil." This last is a honeycomb-wound coil, with variable iron dust slug, and is normally adjusted by means of the slug to be resonant at about the line scan frequency.

It is also referred to at times as a "ringing coil" and, as the name implies, is intended to be shocked into continuous oscillation by the plate current pulses of the sawtooth oscillator. Because the "Q" of the circuit is relatively high (by reason of the large value of shunt C) the voltage developed is essentially sinoidal, and this is superimposed on the natural grid and plate waveforms as indicated in Figure 174.

BASIC WAVEFORMS

Sketch (a) shows the basic waveform to be expected at the grid of a normal blocking oscillator. It is identical, in fact, with the waveform shown in Figure 170 last month.

Sketch (b) is a sine wave as developed across the sine wave coil, while (c) is the composite of the two in the phase relationship which is intended to exist.

The significant point about this latter waveshape is that it holds the grid highly negative over most of the cycle, but when the grid does rise towards cut-off it does so at a very steep angle. Very obviously, spurious noise impulses reaching the grid have a much smaller chance of tripping it over the cut-off region with the steep approach (c) than with the gradual approach (a).

It also follows that an alternating waveform, developed across a resonant circuit, is likely to be less prone to random frequency shift from one cycle to the next than a charge-discharge circuit. It can hardly fail, therefore, to have a stabilising influence on the basic oscillator.

In keeping with this thought the type of circuit shown in Figure 173 is frequently described as a "stabilised" blocking oscillator, while the coil may likewise be described as a stabilising coil.

Since the advantage of the stabilising circuit is closely dependent on the accuracy of its setting, adjacent to resonance, the core is normally kept readily accessible for adjustment. It is set, preferably with the aid of a C.R.O., to produce a waveform of the type indicated in Figure

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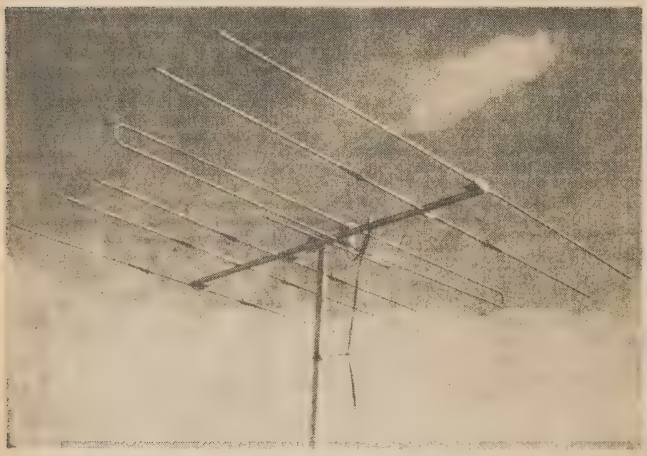

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HOW THE SYNCHROGUIDE WORKS

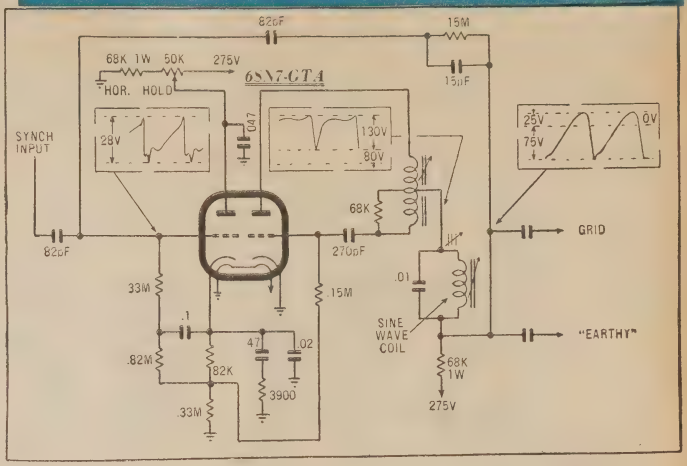

Figure 175: A typical line blocking oscillator (right hand triode) with automatic frequency control tube (left). For waveforms, see figure 176, below.

, at the junction of the sine wave
and transformer tapping.
At the supply end of the sine wave
it is the normal sawtooth capacitor
supply resistor, across which the
ic sawtooth voltage is developed. The
sence of the tuned circuit does not
atly affect the operation of these two
nponents.
An important practical point is that
.001 mfd. sawtooth capacitor also
ovides a path by which the tapping
the feedback transformer is at least
tially earthed. The valve may not
n oscillate, let alone develop a saw-
oth voltage unless this component is
place.

It should be noted in passing that the same stabilising principle can be applied to a multivibrator and is, in fact, quite frequently used.

ORE ADJUSTMENT

In Figure 173 the feedback trans-
rmer is shown as having a variable
n core and adjustment of this core,
ecting the inductance of the trans-
rmer, has a profound effect on the
eration of the oscillator. Among other
ings it varies the natural blocking fre-
ency of the grid circuit and is used
many receivers as a frequency or
ne hold" control.
In other cases it is accessible as a sub-
liary control which has to be adjusted
part of the setting up procedure for
e line scan circuits. The procedure
ay vary somewhat from one receiver
another and is usually set out in
akers' instructions.
As mentioned earlier, the grid in a
ormal blocking oscillator normally re-
rns to earth or to some other con-
nient point of fixed potential.

In actual fact the potential to which the grid leak returns does have a bearing on the time in which the grid capacitor discharges and therefore on the blocking frequency.

It is thus possible to vary the blocking
equency for line hold purposes by
arying the potential applied to the grid
turn resistor. This, in fact, is the basis
or the automatic frequency control cir-
uit to be described.

COMPLETE CIRCUIT

Figure 175 shows the complete line
scillator circuit from the R., TV and H.
958 TV receiver, which represents quite
ypical practice. The right-hand portion
f the circuit is identical with the oscil-
ator shown in Figure 173 and discussed
n preceding paragraphs.
The left-hand triode and its associated
ircuitry provides the automatic fre-
uency control function by modifying
he voltage at the lower end of the 0.15
negohm grid resistor.
Actually the grid return circuit in-
olves two resistors in series, the 0.15
negohm just mentioned and an 0.33
negohm to earth. With the oscillator in
peration this junction point would nor-
nally be expected to be negative by
pwards of 40 volts.
However, the 0.33 megohm resistor is
lso in the cathode return circuit of the
control triode and any cathode current
lowing through it must counter the nega-
ive grid current and make the junction
oint less negative than it would other-
wise be.
With the control tube current com-
pletely cut off, and no modifying voltage
present in the common circuit the oscil-
lator will block at the lowest possible
frequency, consistent with its other ad-
justments. Any increase in control tube
current must shift the potential at the
lower end of the 0.15 megohm resistor
in a positive direction—making it less
negative—and increase the blocking fre-
quency of the line oscillator.

Obviously enough the unmodified fre-
quency of the line oscillator must be set
initially lower than the synch. pulse rate.

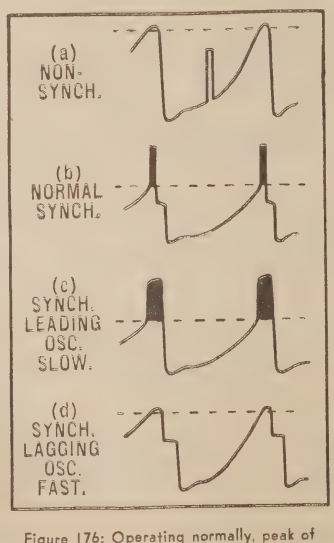

Figure 176: Operating normally, peak of sawtooth coincides with about half the rectangular line pulse. Any drift of the oscillator causes the synch. pulse to lead or lag slightly, producing a compensating bias at the control tube cathode, which is applied to the oscillator grid.

so that operation of the control tube can increase it up to, and perhaps slightly beyond, the actual line frequency.

Because the control tube has an extremely large value of cathode bias resistor (82,000 ohms) its idle plate and cathode current is small and insufficient to modify very much the natural blocking frequency of the line oscillator.

However, any positive-going signal pulses in the grid will produce bursts of cathode current, tending to lift the cathode circuit in a positive direction. Potential so generated is averaged and stored by the cathode bypass capacitors.

INPUT SIGNALS

Into the grid of the control tube two distinct signals are fed—line synchronising pulses from the synch. separator stage and a "sample" of a sawtooth oscillator's output pulse, made deliberately peaky by the nature of the feedback circuit.

Both signals are positive-going in sense and tend independently to increase slightly the average cathode current of the control tube, thus increasing the blocking frequency of the oscillator.

Occurring at different times (Figure 176a) the synch. pulses and the peaks of the sawtooth have only a minor effect on oscillator frequency. However, since the oscillator is presumed to be running more slowly than the synch. pulse rate, they must drift together and finally coincide to supply a very high peak positive pulse to the grid.

This is reflected as a further increase in cathode current, and a further rise in oscillator blocking frequency, possibly sufficient to match the synch. pulse rate.

When adjusted for optimum operation the oscillator runs at the same frequency as the synch. pulses and with the peak of the sawtooth occurring halfway along the rectangular synch. pulse (Figure 176b). This produces a particular value of cathode current in the control tube and therefore a particular modifying

(Continued on Page 123)

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OFF THE RECORD — NEWS & REVIEWS

There has been very little news locally about stereo during the last few weeks. Nor is there likely to be until the first shipment of records arrives and stereo begins to pass from the hands of engineers and enthusiasts to those of the general public. This process should begin soon after this issue appears.

by John Moyle

NOT all the record companies are talking stereo for the immediate future. In fact the E.M.I. group is the only one which freely admits to a shipment of records almost due to arrive.

The others all have plans, of course, but are not admitting to anything else until they see how the dealers and public react to the first releases.

Nothing pressed locally has been available to me apart from some experimental efforts upon which it would not be fair to comment, not that they are bad quality. One of them at least has been heard over the air, made by Festival. The original in this case was by American Decca.

GOOD DISC

So for a further period we shall have to wait and see.

I have had a few more discs sent from America and England, two of which are particularly good.

One was a demonstration disc made by English Decca, and it contains some of the best stereo disc sound I have yet heard. I hope it will be an early Australian release.

Its general quality is really excellent, the cutting amplitude is high, and the surface virtually non-existent.

It is the receipt of discs such as this which show what can be done, and discount some of the earliest examples which may yet become museum pieces.

Maybe I am fortunate, but of the dozen or so discs I have so far collected, none has been really poor.

But from now on we can be expected to become more critical, and ask for a standard which transcends all those of the past.

I am still using crystal pick-ups which by this time have amply demonstrated their practicability and usefulness. They are going to be difficult to displace as the first choice for all but the highest quality—and cost—hi-fi playing equipment.

And talking of equipment, several of the big names are putting the final touches to their luxury lines which we will probably see about Christmas time or soon afterwards.

There isn't much point in tying up a good deal of money in such things until there has been some demand created. Or for that matter in large stocks of less costly players which will probably be ready for sale first of all.

These should be in some kind of supply about the same time as the records themselves, and several manufacturers should be in a position to supply.

In looking forward to the type of equipment likely to be popular, it is interesting to note that a general pattern can be seen in both England and America.

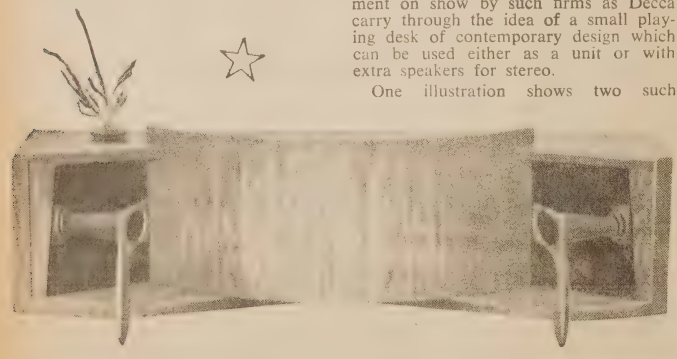
If reports from England are to be believed, stereo was the star at the August Fair, as most people expected. For the first time TV was forced to take a back seat in favour of sound.

PLAYBACK EQUIPMENT

Illustrations of the playback equipment on show by such firms as Decca carry through the idea of a small playing desk of contemporary design which can be used either as a unit or with extra speakers for stereo.

One illustration shows two such speakers mounted in the corners of the room near the ceiling, with the playing desk in between. It has a broad front, and could well be used with the external speakers to give a third channel.

At any rate, this seems to be the popular trend in the less expensive equipment.



The James B. Hansinig Ranger Paragon Speaker System.

In the true hi-fi field things becom much more elaborate.

As expected, we see various wide cab nets with the playing gear in the centr and the speakers at the sides, space from 4 to 8ft.

Others retain the separate unit ide but carry them out more substantiall

Matched cabinets to hold multipl speakers come in baffles, boxes an columns. The speakers are arranged all manners to achieve a favoured di tribution of sound.

Considerable thought appears to hav been given to styling for all cabin work, for with stereo there isn't muc use evading the fact that at least thre units are involved as the alternative one very large one.

And nobody likes the idea of moun ing two speakers plus playing equipmer in a single cabinet.

In America, as might be expecte they are really going to town on luxur equipment.

Cast your eye on the speaker syste a picture of which is enclosed herewit

HIGH POWER

It is available from James B. Lansin and is called the Ranger Paragon. th ultimate in balanced STEREO LIS TENING.

One can well believe it, particular when its specifications allow for 60 watt each channel, a height of 33¾ inches, depth of 24½ inches, and a width 106 inches.

That's just short of nine feet.

There are two bass speakers couple to bass horns, the mouths of which a self-evident.

The middle and upper ranges a radiated from two special drivers (tho strange-looking things with legs) and th sound bounces to you and all arour the room from the curved surfaces whic are known as acoustic refractors.

This would really be something have in the end of your lounge-room.

The interesting thing is the use of di persed middle and high frequencies, we separated as to their source but we able to merge in the centre to avoid th hole in the middle.

This hole seems to have arisen as major difficulty with stereo for tho who are insistent on broad, masse effects such as an orchestra demands.

SMALLER SET-UPS

And the use of wide-angle, upp register propagation is growing in popu larity.

For small set-ups, mainly to be use for popular music, and where the speak ers cannot be far apart, there may b many advantages in playing up the se aration of stereo, for most of the dis will do this anyhow.

mall pop bands with or without
ers lend themselves to this technique.
ut an orchestra is another thing. Even
t monaural discs I have always pre-
ed multiple speakers and diffused
nd, but it did seem doubtful as to
ther the same idea would be best for
eo.

low I am inclined to think it will be
uite a popular idea overseas is to
nt the middle and high speakers hor-
ntally, and to suspend over the cone
flector to spray the top notes around
room

Others have brought forward a sug-
ion made in these pages some time
of taking a split from each channel,
ing it, and playing at lower amplitude
ween the two speakers.

There are even hints of a three-chan
record now in development, presum-
y with a super-sonic FM carrier add-
for the third channel.

But that is in the future. For the
sent, we have the entire field of pick-
, amplifiers, speakers and enclosures
ting to be worked over, and it's going
be an absorbing business.

Before the next issue goes to press I
e to have some high-grade moving
type pick-ups to use, and had bet-
leave off watching TV and build up
new control unit.

Otherwise I am going to open a par-
some day soon and look over the
ntents in a fever of frustration!

NEW RECORDS OF THE MONTH

GERSHWIN—Rhapsody in Blue. Played by the Philadelphia Orchestra with Oscar Levant, conducted by Eugene Ormandy. Coronet KGC 121. STRAUSS — Rosenkavalier Waltzes; TCHAIKOWSKY—Sleeping Beauty Waltz. Played by the Philadelphia Orchestra, conducted by Eugene Ormandy. Coronet KGC 120.

GRIEG—Peer Gynt Suite No. 1. Played by the Philadelphia Orchestra conducted by Eugene Ormandy. Coronet KGC 118.

STRAUSS—Polkas; Die Fledermaus, Pizzicato, Explosions, Thunder and Lightning, Tritsch-Tratsch. Played by the Philadelphia Orchestra conducted by Eugene Ormandy. Coronet KGC 117.

IPPOLITOV-IVANOV — Entry of the Sardar, In the Mosque; BORODIN—In the Steppes of Central Asia. Played by the New York Philharmonic Orchestra conducted by Dmitri Mitropolous. Coronet KGC123.

TCHAIKOWSKY—Marche Slav; RACHMANINOFF—Prelude in G Minor. Played by the Philadelphia Orchestra, conducted by Eugene Ormandy. Coronet KGC 124.

DVORAK—Largo from New World Symphony. Played by the Philadelphia Orchestra, conducted by Eugene Ormandy. Coronet KGC 119.

MOZART—Marriage of Figaro, Impresario, Magic Flute Overtures. Played by the Columbia Symphony Orchestra, conducted by Bruno Walter. Coronet KGC 122.

Yet another batch of these unique 33 p.m. 7-inch discs features music taken

GIESEKING PLAYS MENDELSSHOHN

WALTER GIESEKING

MENDELSSOHN.—Songs Without Words Nos. 1, 6, 12, 16, 18, 20, 21, 22, 25, 29, 30, 33, 34, 40, 42, 45, and 47. Played by Walter Gieseking. Columbia 33OCX1479.

There has been some controversy about this recording and after hearing it I can see why.

The obvious comment has been made that Gieseking plays very slowly and deliberately. One critic considered this was due to the fact that the pianist was an old and tired man when he made the record. For all I know he may have been—there was plenty of reason for this as it was taped during the last weeks of his life.

But, after several playings of the disc —something unusual for one who has so many to hear in the course of a month —I think the reason is that Gieseking intended them to sound exactly as they do.

There is nothing quite like these compositions in the whole piano repertoire, and they have been far too long considered no more than convenient "pieces" with which we all branch out into the realms of classical music, having mastered our early exercises and baby pieces.

I think many of them are more suited to a tempo faster than used by Gieseking, but I will also freely admit that he has an excellent case for playing them as he does.

The title, "Songs Without Words," means just what it says, and here they have been treated accordingly.

Gieseking has obviously thought them out in a manner typical of his sincerity. To him they are songs. If you listen you will hear how he has divided the solo line from the accompaniment, and it is quite magical to note how beautifully he has managed this dual role.

And if one were to sing these melodies, it's hard to see how it would be possible to proceed much faster.

Without pursuing the obvious fallacies of this line of thought, it is clear that we must go along with the pianist in this idea if we are to understand what he was about.

You can buy many an argument as to whether standard performances over the years have lost sight of this intention, or whether it was ever envisaged by the composer.

At all events here is a lovely and original record which has no contemporary from any point of view.

The sound is much the same as many Gieseking discs made in this period—warm and full with a slightly tubby bass. The surface has a very slight rustle which is easily tamed if you are fussy.

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ull-sized releases.
ll cases the transfer has been very
one musically. A direct compari-
ould show but little deterioration
t cases, and certainly not enough
in any way serious for the pur-

e of them represent an opportun-
have good music played by first-
orchestras at a low price. Where
has been made from an existing
ing, the source is mentioned on
cket. All of these have most at-
e designs.
icularly good I thought the Grieg
ynt Suite, In the Steppes of Cen-
ia, Rhapsody in Blue.
New World Largo is spoiled by
ening in which the first notes of
chestra are chopped off (making
ound curiously like a piano) and
abrupt and awkward turn-over.
to fade out than to chop short.
of the others also has a sudden
ver.
aces, etc., are O.K., and Coronet
do well with them.

★ ★ ★

CHUBERT—Symphony No. 8 t Minor (Unfinished). Played by Vienna Philharmonic Orchestra ducted by Carl Bohm. Decca 5257.

r all, what is Allegro Moderato? won't be any the wiser if you try d the answer by listening to the s versions of this Symphony.
telli brushes aside any implications t should be Moderato and dives he first movement about twice as s anyone else.
anyone else is probably Bohm obviously has seen the Moderato ot the Allegro.
main comment at this point, ore, is that if you like your ert played vigorously, or at least Allegro, you won't want Bohm.
if you are more interested in fully controlled and poetic sound, ly beautiful playing and clean, clear ling, you probably will.
m sees no necessity to dramatise usic, or glamorise it, or do any- but let it sing.
orchestra has joined him in play- with infinite sweetness and lovely quality. The second movement, y because of this, and because of ntle light and shade Bohm has pro- , is certainly as good as any yet ded.
tunately the surface is good, too, t there are no distractions to ruin iet, still mood.
e I was able to relax with Bohm's I liked everything about it.

★ ★ ★

ISZT RECITAL.— Eight items yed by Gyorgy Cziffra. HMV LP1534.

Cziffra is a young and brilliant t whose work is causing a minor tion on records.
is a Hungarian who escaped from pest during the recent uprisings at country and he has made a lty of Liszt. In 1955, he won the pianoforte competition in Europe has since made a number of rings for HMV, most of which have o be released.
is record shows why he has been ccessful.
st of all he does not trade in wild tion or prodigal power, although he produce both when required.
e most immediate impression of his playing is an astonishing technique. It is not based purely on speed or dexterity but has a subtlety which embraces all the refinements of pedalling, timing and touch.

In fact he is at his very best in such things as the Valse-Impromptu which isn't brilliant at all, but played with infinite delicacy and charm.

At the same time he is capable of breathtaking velocity and absolute precision, and does not hesitate to mix it with explosive dynamics which I feel even Liszt might have envied.

Listen to the Grand Galop at the end of side two. The combination of his pianistic resources is quite dazzling — an exhibition of keyboard mastery.

One rarely hears musicianship of this kind.

Whether it would produce similar results in other fields we have yet to find out.

In the meantime this example is guaranteed to make the most blase critic sit up and register.

Technically it is very good with a quiet surface, but quite frankly I hardly noticed this part of it through my admiration for the performance.

★ ★ ★

BEETHOVEN. —Symphony No. 3 in E flat Opus 55 (Eroica). Played by the Cleveland Orchestra conducted by Georg Szell. Fontana CFL 1001.

This record will grow on you. It hasn't the strength of Toscanini and yet it is strong; it hasn't the majestic air of Klemperer and yet it is majestic.

I was disappointed as the first movement proceeded. Szell is not normally a spectacular conductor — he is more a master of moderation and there is mastery in this performance.

His extensions are also noticeable, and often detrimental to the longterm size and shape. You have to go along with Szell's musical memory — you must settle down for a journey without losing sight of the ultimate goal.

Often his carefully prepared passages are a joy in themselves, and nowhere more enjoyable than in the last movement, probably the best of them all.

Here he is able to lift out ideas and effects which are often unnoticed, and it's a rather delightful experience to hear them.

His second movement dwells long and lovingly on the music and achieves many moving effects.

The Cleveland Orchestra give a distinguished performance. Its ensemble is near perfection; it plays easily together and with complete co-ordination and is equal to every mood and demand.

I don't remember hearing a more musical American orchestra or one which relies less on absolute brilliance on the one hand or glamour on the other. Its ring of sincerity is felt all the time, but there is nothing obtrusive about its work.

Technically the disc is very good indeed. It is concert hall without loss of balance or immediacy. All its solo and sectional work blends in gracious sound but retains its individuality.

And so when the symphony ended I was not disappointed at all, but pleasantly aware that there is a mid-path for the Eroica which needs no apologies and is its own justification.

A great many people will like this new record.

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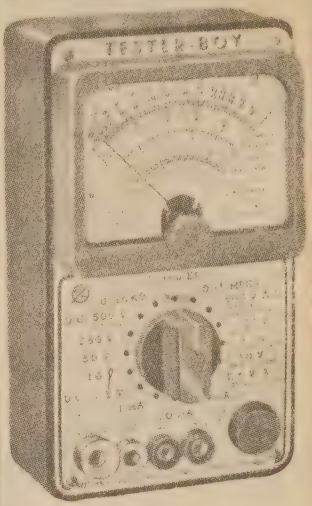

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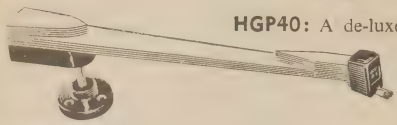

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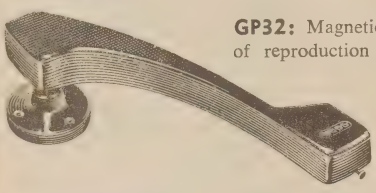

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l why not? I haven't much patience he too common idea that decent belongs to the few that under- it, as though they were a race

sic is a language in which there great subtlety of expression on a many subjects. But not everybody rested in the same subjects. One reactions to life are limited will lly show it in his reactions to — a wider experience enables him k deeper. Music is what we are led of when we hear the notes and n't dig out what we can't see.

ie people of course never acquire se of music as a language. Some o lazy or tired or hurried to spend me in learning it, something well the limits of average intelligence. y few are quite without any re- Mostly it is a matter of oppor- and this can be largely controlled. 's far better to have some part of music than none at all.

s parade of high spots is well cal- d to help in providing this, and be- of its limited aim the fact that l items aren't very well played be a disadvantage.

much stronger recommendation is lear, vivid recording, particularly rable to such things as individual heard to advantage in the Grieg Dvorak.

hough several of the items are ar- l and/or condensed, there has been rious alteration to the music as n.

it is almost totally devoid of style. is a pity. The Beethoven and Wag- ust be among the worst perform- ever.

surface here and there is audible here are several spots of groove Otherwise it gets a clean sheet.

★ ★ ★

AINT-SAENS.— Concerto for lo and Orchestra in B flat major us 34.

OCCHERINI.— Concerto for lo and Orchestra No. 1 in A jor Opus 33. Played by Ludwig elscher, cellist, with the Berlin lharmonic Orchestra conducted Otto Matzerath. DGG LPEM 89.

t more than half-a-dozen cello con- have achieved any serious fame, doesn't give the cellist much e when he wishes to show what n do.

I have remarked once before the t of recording has been of great nce to cellists, for it has allowed to be heard when they are often disadvantage in the concert hall. good cello has quite a strong voice, ts lack of sharp penetrative power, ts homogeneity with the orchestral s, often cause it to be drowned out.

Even in solo passages, many concert halls are most unkind to it.

But careful microphone work can save it from either fate, and in fact can build up its tone so that it comes through far greater than life size.

If the result doesn't always tie up with what is heard from the platform that doesn't really matter. We could make a good case for the microphone in many musical fields.

This record contains two of the cello concertos referred to, and they really are very good.

I haven't heard the cellist before and the jacket notes don't satisfy my curiosity.

He shows a beautiful, dark tone, and plays with a strong romantic flavour.

The Saint-Saens I thought particularly successful. The only other recording I could extract from the files is a Capitol featuring Andre Navarra who is less romantic and decidedly more lively. His recording, however, although sharper, isn't on the whole any better, although the microphone is placed nearer the cello and provides more forward sound.

The surface of this new record isn't quite as silent as the best DGGs, but by no means bad.

★ ★ ★

JOSEF SCHMIDT.—Eight of his most popular songs recreated as the Unforgettable Voice. Parlophone PMDO1056.

Those whose minds go back to the 30's will remember the voice of Josef Schmidt, almost as well as that of Tauber and a couple of others who blazed across the recording world.

Schmidt had a range and quality all his own. He was often called the German Caruso, although he was hardly to be compared with the much more versatile Italian

But who could ever forget his "My Song Goes Round the World," or "Funiculi Funicula"?

The weakness of his voice was in the lower range where it virtually collapsed altogether. But for a man who could sing full voice beyond the high C, this wasn't a great handicap.

Nor from a broadcasting and recording point of view was his diminutive size, reputed as being under 5ft.

How such a small man could produce such a powerful and vital voice was a mystery.

His last years were tragic. He was a Jew, and, although he managed to leave Germany before the Fascists caught up with him, he was interned in Switzerland, where he died, a young man, in 1942.

Naturally, his recordings belonged to the early electrical era, but so well suited was his voice to the microphone that his recreated singing is astoundingly good.

Once or twice near the end of a number we can hear some deterioration familiar to those who knew his 10-inch 78's, but the addition I suspect of some artificial reverberation and a dubbed modern orchestra has obliterated many anticipated faults. Nor is there any of the surface noise, which spoiled many of the early Caruso discs, for instance.

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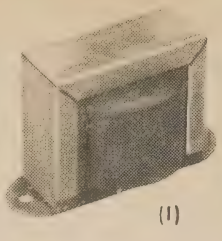

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)ZART.— Sonata No. 10 in t K378; Sonata No. 15 in B K454. Played by Jascha Heifetz Brooke Smith. RCA L16130.

many people must have certain tions when hearing Heifetz and erfectionists playing works such e?

downright disturbing to suggest violinist as great as Heifetz could cised in a Mozart sonata.

omething seems to come between d what is generally imagined to zart style.

the unfailing consistency of ue, the facility with which each is turned with ease in a well- manner? Or is it that years of g to lesser violinists has con- d us against this standard?

yet there are moments such as w movement of the K378 when uld not imagine a more beautiful nance.

or the speed of the faster move- we must remember that tempo is ive thing which cannot be separ- om the performer. You cannot put weights on Heifetz' fingers to keep ck to the normal idea, simply he can't gear his reflexes back

any rate the finished article is that of any contemporary, even ented ones.

r one, find it rewarding to listen basis even if at times I am led rust that fatal facility.

eems so hard to mark it down t.

violinist is the one you will hear all the time, although the pianist l. Technically the result doesn't the very best sonatas available, ere is some faint print-through he tapes.

on the whole it is a good issue.

★ ★ ★

YRON JANIS — The Blue ube (Strauss); Waltzes Nos. 1, nd 15 (Brahms); Waltzes Nos. d 14, Ballade No. 1 in G minor, le No. 8 (Chopin); Liebes- n and Hungarian Rhapsody No. iszt). RCA L16140.

r attraction to this record will rest on whether you are in the market piano recital of popular classics. e's no particular reason why you not be, for all these numbers have ne general kind of appeal, and if to the trouble to put it on the le there isn't any reason why you n't allow at least one side to com- ts run.

days when we are happy to change after a single Chopin waltz went th the 78, and haven't made much omeback with the 45. Most people their collection of single items d on a 12-inch LP which seems to ular in such a form in all fields sic.

his instance, at least, I didn't find d to hear a whole group played cession, although I don't normally s for pleasure.

s does them all attractively enough nothing particularly remarkable good or bad. He adopts a frankly tic style which at the same time ust, with a very strong right hand firm sense of rhythm.

on't know whether he has paid attention to the difference be- a Waltz, a Ballade or an Etude, is a sameness in style which could have been avoided with great advantage to light and shade, and contrasts which could have been featured in more than name only.

I had the feeling that, in the mood he shows here, he was more at home in the Liebestraum than anywhere else, although he shows no reluctance to dive into the fireworks elsewhere.

Piano tone is quite good, and the recording clean. A rustle of surface noise can be heard.

★ ★ ★

BEETHOVEN — Sonata No. 14 in C sharp minor Opus 27 No. 2; Sonata No. 8 in C minor Opus 13; Sonata No. 23 in F minor Opus 23; (Moonlight, Pathetique, Appassionata). Played by Orazio Frugoni. Vox APL 7160.

Frugoni makes his way through the three famous Beethoven sonatas with admirable zeal, vigour and enterprise.

In fact if I had to name my most lasting impression of this work, I would say —vitality.

He presses on at all times. Even in the slow movement of the Appassionata he drives forward, ignoring every opportunity to become introspective or even preoccupied with tone colour or magnitude.

I like this atmosphere of urgency and immediacy where Beethoven is concerned — it is an essential ingredient.

But it should be coupled with a deeper understanding.

The Pathetique is played in the same way.

Once again Frugoni's drive is the dominating force in the first movement, but it has much broader wings and a more majestic flight than is heard here.

As with so many Vox records, this one again offers you a good deal of well-performed music for your money. No one can doubt that it is good value.

★ ★ ★

LISZT — Spanish Rhapsody, Feux Follets, Six Paganini Etudes. Played by Ruth Slenczynska. Festival-Decca FL-7008.

This talented woman provides an interesting contrast with Cziffra whom she in no way resembles.

Her approach is much more traditional, and on this disc her piano has great resonance and strength.

Behind her playing there is the romantic Liszt in full bloom, but none of the high voltage potential or touch of genius which Cziffra exhibits in the first notes.

She is nearer the Fanardi school, and a remarkably well-equipped performer in her own right.

She has authority and assurance which many men might envy, and a formidable technique.

These are all in evidence in the Paganini Etudes which are in fact quite powerful performances.

The Second, which was so unforgettably recorded by Horowitz in the 78 days, is a very good example of her ideas on Liszt, and her execution of them.

Some of the others are injected with an air that doesn't really belong — they are mostly show pieces and sound best as vehicles for virtuosity rather than probed for any other values.

The recording has breadth and resonance which suits the music and the way it is played.

★ ★ ★

BEETHOVEN.— Symphony No. 7 in A Opus 92. Played by the NBC Symphony Orchestra conducted by Arturo Toscanini. RCA L16136.

You will have to balance a Toscanini performance against sound which is not good compared with today's high standard. It has a quality hard to associate with a straight recording. It sounds as though some attempt had been made to artificially warm up a dead and cold original.

It becomes noisy and confused in the loud passages and in the quiet passages where more individual work is heard there is little life to the instruments.

That's the worst side. The good side includes displays of the virtues which always go with a Toscanini performance, often better than that of anybody else.

The first and last movements come into this category, but unless you see eye to eye with the conductor's urgent style you might object to many brusque moments in the second.

The position is therefore pretty clear. The sound is old but Toscanini's Seventh is part of recording history as a magnificent performance.

The bass is not strong but I liked it with two extra notches.

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HAIKOWSKY.— Symphony in F minor Opus 36. Played RIAS Symphony Orchestra, conducted by Ferenc Fric-GG 18039 LPM.

leave out a couple of contenders title, particularly the Leningrad from the same company, one ake out a good case for this s being certainly near the top. most of the things that make up performance without any cal-o make one remember it as out-or unusual.

is very great dynamic range ch excitement too, but a good powerful work is chased into a ven noise, as in the big climax niddle of the first movement. ollowed by a very quiet section n surface noise begins to dis-Contrasts in both speed and are over-simplified, and tend to nemselves near the outer edges respective scales.

ast movement is probably the it we appreciate the fine quality ipline of the orchestra. ecording generally is quite good norns in particular distinguish es by their quality and balance.

★ ★ ★

HAIKOWSKY.— Symphony in B minor Opus 74. Played Vienna Symphony Orchestra cted by Antal Dorati. Fon-698001CL.

fectly good recording and a per-e adequate for most occasions. rouble is there are one or two versions which have particularly aims to top place.

i seems happy to allow the o play itself along, often with fference or guidance from him. econd movement is an example

oceeds with the regular beat of ay engine and with very little eling.

e conductor's intention was to ie music to avoid a descent into oly emotion he has done a good has done more than this—he duced a movement which doesn't eyelid.

you can't do this with the ue and expect to really succeed. oesn't move you to some kind tion it hasn't done anything. only serious criticism therefore it is far too pallid. The sound clear and clean line although I gree with the jacket's claim that bulous.

certainly can vouch for the fact surface is well-nigh perfect, and nna Orchestra is always good.

★ ★ ★

OKOFIEFF.—Cinderella Ballet s 1 and 2. Played by the nt Garden Orchestra conducted ugo Rignold. RCA L16131.

OKOFIEFF—Cinderella Bal-lusic Sections 1, 2, 9, 10, 11, 3, 14, 15, 16, 17, 19, 20, 22, 9, 30, 32, 34, 35, 36, 37, 38 50. Played by the Royal Phil-onic Orchestra conducted by rt Irving. HMV CLP1144.

is one of Prokofieff's most am-ballets, written prior to the period e with other composers was taken by the Russian political leaders writing music more in conform-the party line.

based upon the traditional Cin-derella story, but elaborated in conception and action to support a wide series of character and romantic episodes.

Much of the lighter mood is, of course, supplied by the Ugly Sisters, the nature of whom has been varied widely according to the country of presentation.

And the romance of the prince and Cinderella carries much more than is indicated by the story as originally told.

I suppose it is inevitable that two records on a long neglected theme should appear simultaneously, setting a nice problem in appreciating a work which has probably never been seen in Australia and heard just as rarely.

Fortunately the music is only lightly duplicated on the two discs, so that each fills in its part of the picture.

The HMV is really a succession of episodes in order of appearance, whereas the RCA is composed of two suites, each taken from the ballet itself.

As it is a full-length work, there is plenty of material to serve all these purposes. Presumably the suites were arranged by Prokofieff himself.

The music is very easy to listen to. It has plenty of melody and atmosphere, and not at all difficult fare for those who don't take kindly to modern tonalities.

Prokofieff's clear musical thought and orchestration allow of no mistakes as to what he is about, and the music itself is most skilfully programmatic in mood and idea.

Both discs are well produced. The RCA has a sharper sound, with some impressive bass passages. The HMV I thought rounder and more atmospheric, and the orchestra is fractionally more at home in all respects. It would probably be the first choice, although the succession of short episodes does make the full listening period a bit scrappy.

This, of course, is hard to avoid, and doesn't altogether disappear in the two suites, but the main interest will be in the work and the point probably won't worry most.

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I can commend them both.

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SHORT-WAVE NOTES BY ART CUSHEN

NEW REGIONAL STATIONS FOR A.I.R.

Several new regional stations of All India Radio have been heard in the 60 metre band at 1.30 a.m.

THE broadcasts on shortwave from regional stations of All India Radio has found that with the broadcasting of news in English. these new stations can now be easily identified. The transmitters at Ranchi, Bhopal, Lucknow and Simla have been found at good level in the 60 metre band at 1.30 a.m. Interference from the many Indonesian stations is noted to his hour but, after this, stations from this country do not cause much interference. Only the transmissions from Sumatra have been noted as using this band, with the Indian and Pakistan signals after 1.30 a.m.

Madras which has been using 4920 KC at good strength now releases a program in English from the Voice of America at 1.45 a.m. The 15 minute news in English is normally followed by news in Hindustani but this now appears to be broadcast by only a few of the transmitters.

The news from Delhi in English at 1.30 a.m is now heard on transmitters at Delhi on 6040, 7140, 9705, 9850, 12,020, 15.480 Kc. Bombay on 7240, Calcutta on 7210, 9530, Madras on 4920, Simla on 4760, Bhopal on 4840, Lucknow on 4880, Gauhati on 4940, and Ranchi on 4850 Kc.

Rangoon on 21,570 Kc.

A NEW morning transmission of the Burma Broadcasting Service has been noted on 21.570 Kc, to 12.30 p.m. daily. The broadcast has English to 12.15 p.m. which includes light music, and then presents 15 minutes of news in Hindustani. Signals are very strong and build in strength till the transmission concludes at 12.30 p.m. The station announcements indicated that the next broadcast in English would be at 5.00 p.m., when the station is using 9640 and 7112 Kc. The further transmission in English is from 12.15 to 1.15 a.m. and this has been reported on 15345, 9640, and 7112 Kc.

Nibi-Nibi on 7712 Kc.

BROADCASTS from Nibi-Nibi described as the Island Paradise of the Pacific are now being transmitted on 7712Kc. The station is reached with reports to the Chief Wireless Officer, Information Service, P.O. Box 24, Nebi Nebi. The station operates on 618 and 7712 Kc, 8.00 to 10.00 a.m., and from 5.00 to 8.30 p.m. The Chief Radio Officer is M. Carrgale Jarrar. The station verifies with an attractive verification card which features a map of the island, reports the Deutche Welle DX Bulletin.

Tananarive on 5020 Kc.

SIGNALS of a very strong nature have been heard from Radio Tananarive in Madagascar on the new frequency of 5010 Kc. The station has programs in French to sign off at 5.30 a.m., and the program is basically of light music. The station in the past has been heard with this service on 3232 Kc, with this same network, but the increase in strength suggests a new transmitter. The station signs off with the French Anthem and then plays the Tananarive identification tune three times before leaving the air. Madagascar is one of the strongest signals at the moment on the 60 metre band and will enable this seldom heard country to be tuned by many of our readers.

New signals from Ecuador

TWO new signals from Ecuador have been heard over the past few weeks and both at good signal level. The station on 5700 Kc which we have been hearing to 4 p.m. has been identified as a new transmitter located at Santa Ana de Cotacachi, Inbadura Province in Ecuador. It has been using the slogan Radio Cotacachi, and closes at 4 p.m. The sign off announcement only indicated the broadcast band frequency, and the signature tune, March Militaire, is played under the closing identification. Radio Nacional ,Espejo in Quito using the channel of 4680 Kc, has been noted at 4.30 p.m. when closing but on occasions transmission has been to 5 p.m. This station has the call sign HJGB1, and the address of the station in Esmeraldes 856, Quito. The station using 4680 Kc, has at times been tuned as high as 4700 Kc.

Notes for the Next Issue from readers should be sent to Arthur Cushen, 212 Earn Street, Invercargill, N.Z. All Times are Eastern Australian.

Chillian on 6020 Kc.

A NEW signal from Chile has been heard on 6020 Kc in the afternoon to sign off at 3 p.m. The station uses the same channel as OAX4Q in Lima, which dominates the frequency to a few moments before 3 p.m. Following the sign off of OAX4Q the Chilian station is at fair strength till closing with chimes at 3 p.m. This new 10Kw transmitter has also been observed at 10 p.m. but has very considerable interference at this time. The station has the callsign CE602 and the slogan "Radio Diego," the address being Uno Norte 1075 Talca, Chile. After the frequency clears with the sign off of OAX4Q then at CE602, station XEUW in Vera Cruz, Mexico has been heard to sign off at 4 p.m. This station has the slogan, El Eco de Sotavento, Vera Cruz.

FLASHES FROM EVERYWHERE

PANAMA station HOF31 using 9685 Kc has been heard opening transmission at 8.57 p.m. This report came from North America and in this area our main trouble in hearing the signal will be the interference from Melbourne on 9680 and Singapore on 9690 Kc. The Panama station opened its transmission with a program in Spanish.

MOZAMBIQUE has been heard with a new station which is operated by the expanding Radio Club of Mozambique, which carries commercial programs in English and Portuguese. The new station, Radio Sambizia, has been heard on 3405 Kc on Monday from 3 a.m. to sign-off at 5 a.m. The station has identification at the hour with Portuguese identification, preceded by a four-note chime. The station has the bulk of the program devoted to local dialects.

STANLEYVILLE in the Belgium Congo is the site of the transmitter which is being heard in Cyprus on 6078 Kc at 4 a.m. The station closes at 5 a.m. and has news in French at 4 a.m. and a further news sessions at 4.45 a.m. is relayed from Leopoldville.

ANKARA Police Radio has been heard on 6120 Kc with broadcasts of popular western music and Turkish announcements at midnight.

BAGHDAD, the capital of Iran since its new Government in office, has instituted a foreign service. The station has its Home Service on 7180 Kc. The Foreign Service broadcasts on 6188 Kc and 3297 Kc, and is operating 2.00 p.m. to 10.00 p.m. in Arabic, 10.00 p.m. to 10.30 p.m. in English, 10.30 to 11.00 p.m. in Turkish, Urdu from 11.00 p.m. to 11.30 p.m., 11.30 p.m. to midnight in Arabic, midnight to 4.00 a.m. in Kurdish, 4.00 to 4.30 a.m. in French, 4.30 to 5.00 a.m. in German, 5.00 to 7.00 a.m. in Arabic.

SINGAPORE in its English transmission has been noted on the new frequency of 9665 Kc with programs relayed also on 720 Kc. The Singapore station has been using several frequencies in the 31-metre band on a test basis and this latest channel has been used at midnight with news at this time in English.

SEOUL has changed its frequency for the transmissions to Hawaii and North America, moving from 11.925 to 15.255 Kc. This new frequency has interference from the FEN Tokyo station, which uses 15.257 Kc. Seoul has broadcasts at 3.30 to 4.30 p.m. and to Hawaii from 6.00 p.m to 7.00 p.m.

DJAKARTA, station of the Indonesian Air Force, has been again heard from opening at 7.00 p.m. The broadcasts are well known for the sign-on of an aircraft passing over the microphone point. The Air Force station has mostly programs of dance music. A report from North America states a similar program is being transmitted on 9550 Kc with the sign-off at 1.00 a.m.

SURIMAN station PZC has moved from 15.405 to 15.460 Kc but this latter channel has severe interference. Our North American reporter states Morse is troublesome on the new frequency which is heard from 9.30 to 11.30 a.m. The station broadcasts from Paramaribo, in this South American colony.

HAVANA station on 9620 Kc has been reported to a listener to Radio Australia, who hears the station with the call sign of COJK. Broadcasts on 9620 Kc and is at Camaguay. and h noon.

MEXICAN station XEW has announceme they are also using the short-wave cha 6075 Kc, and this station has been noted p.m. with interference from CE607 at th

RHODESIA and Nyasaland's Federal Br ing Corporation, which operates from Lusa been in operation since July and uses 7 from 3.00 to 4.30 p.m and from 9.00 10.00 p.m. daily, except Sunday, when the is 4.00 to 10.00 p.m. and from 1.00 to 6. The station uses 4965 Kc, is on the a 3.00 to 6.30 a.m. and on Sunday fr 7. The old 2500w transmitter is on 4.70 broadcasts 8.00 p.m. to 5.00 a.m. and days the transmission opens at 7.00 p.m other former transmitter with a power o which was known as ZQP, is on from 4.00 p.m. on 4826 Kc. The signals on have been such that the Mombasa stati merly on that channel has now moved Kc, but interference is still not completely ated.

BRAZIL'S new capital for the Republic is under construction at Brazilea, has been by the World Radio Handbook as one the transmission heard on 11,715 Kc. F in the early afternoons are heard in America. The new capital, Brazilea, is State of Goeas.

EDULMUNTON, the home of the trans of VE9AI, on 9540 Kc, which we reporte months ago, has the news that the st transmission of VE9AI was discontinue June 30. The station relayed the broadc transmitter CJCA.

TALCA in Chile, is the home of a ne nitter which has the power of 10Kw a the frequency of 6020 Kc. This station is to be in operation from 10.00 p.m. to 3

SRINAGAR, which is broadcasting from is at present on 6110 Kc from noon to 2 and on 9660 Kc from 4.00 to 5.14 p.m 4860 Kc from 10.00 p.m. to 3.30 a.m

ITALY, with its Third Program from has been heard in Europe on 4010 Kc the normal band. This station is rep 6.00 a.m. and its assigned frequency is

SAINT LOUIS, The Voice of Maurat Senegal, is using the frequency of 6043. v grams on Radio Dakar. The Station is ceived in Europe from 5.00 a.m. to 10 and has programs in both French and languages.

PEKING has its transmission to Europe the frequencies of 9460 and 11.650 Kc. sion in English is released at 5.00 to 6 and from 7.00 to 8.00 a.m.

ADEN Broadcasting Service, which on 7170 Kc, is now reported on an schedule. Programs in Arabic are now s 9.00 p.m. to 6.30 a.m., with 7500 wa mitter. News in Arabic is released 10 p night, 1.30 a.m. 3.00 a.m. and 3.45 a.m the Arabic programs of the B.B.C. are at 4.00 a.m., 5.15 a.m. and 6.15 a.m.

REUNION, which broadcasts from St has dropped its 7.15 a.m. relay and n operates on 3380 Kc with 1500 watts. tion is on the air from 12.30 to 1.45 5.00 to 7.00 p.m., and midnight to 4.00 to 5 a.m. on occasions. On Sundays gram is broadcast from 2.00 p.m. to 4.0

SANAAH in Yemen has been rep Europe on 5985 Kc. This station has Arabic at 4.15 a.m. and leaves the air a.m.

GOA in Portuguese India, which been promised a new transmitter, has as been heard on the lower powered equipme latest reception has been on 4800 Kc a.m. when the station announces as and 9610 Kc, though former frequency lower in actual fact.

TIRANA in Albania has been rep using the two frequencies of 6915 and in the transmission to Europe and the N The station is on from 4.00 a.m. in Serb 4.30 a.m. in Albania on 7850 Kc. F a.m. to 7.00 a.m. the service is on quencies. Programs comprise Greek Arabic (5.30 a.m.), Italian (6.00 a.m.) (6.30 a.m.), French (7.00 a.m.), and Ara a.m. A program in Albania is carried Kc only, from 8.00 to 8.30 a.m.

Macau on 17785 K

MACAU is to again operate a short vice, reports World Radio Handb is to use the frequency of 17785 Kc, fr p.m. to 1.00 a.m. using 300 watts Ra Verde will carry the programs in English and Portuguesse and will carry the which in the past have only been heard ke with the callsign CR9XL. This sta 3Kw and signs off at 2.00 a.m. The st dress is Emisora Vila Verde, Macau. In 1940's transmissions on short wave w heard from this small Portuguese colon Radio Club the Voice of Portugal in the using 9300 Kc. was often received.

HE HAM BANDS WITH BILL MOORE

Remembrance Day Contest conducted by the Wireless Institute of Australia was cially opened by the Prime Minister, Mr R. G. Menzies. In his opening remarks he spoke of the value of the amateur radio movement to the community at all times.

IA's Eleventh Annual Remembrance Day st was officially opened by the Prime Mr R. G. Menzies, in a ceremony pre- mediately prior to the opening of the The recording of the speech was pre- Canberra and broadcast by official WIA n all States of the Commonwealth. ime Minister pointed out that the con- conducted in memory of the 35 amateurs down their lives in World War II and d as an exercise in emergency working. ke of the value of the movement in peace and how it provided a reservoir of rsonnel for any emergency. Mr Menzies t that out of a total of 1,800 licenced in 1939, 1,000 volunteered for service armed services. With their members tely known as "Hams," amateur radio cientific hobby internationally recognised ected and written about in national war stated the Prime Minister.

ERING WORK

tinued and mentioned the pioneering of waves by the radio amateur.

mention was made of the work of mateurs during the floods and how they he strain on public communications dur- emergencies.

ime Minister then declared the contest open.

ll call of WIA members who paid me sacrifice was then called by Ken VK1AIL, and the ode to the fallen fol- The ceremony was very impressive and tribute.

ening received considerable publicity over C. and Commercial Broadcast stations. session over 40 stations broadcast the opening ceremony by the Prime Minister. ssion was recorded from the 7mc broad- VK2WI and at the completion of the the opening minute of the contest was the band was just a mass of signals Q Remembrance Day.

very impressive scores will undoubtedly Quite a number of stations recording contacts.

usual post-mortem immediately at the n of the contest scores were compared. ighton, VK3ATN, last year's individual ade just on 400 contacts with approxi- 00 points recorded from VK6 contacts VK6RU and VKIPM will also be heavy in N.S.W. VK2IU, VK2ASZ, VK2QHH, will be amongst the leaders.

nds 10 to 80 metres opened at times impression was that propagation condi- e not quite as good as last year. rticipation was well down and telephony provided the greatest number of points. in the early hours of Sunday was high y points were amassed on the lower bands over the longer distances. ur RD contest has been completed. A plea- mory to the participants and a reminder mateurs of those of our ranks who are the perpetual trophy.

VFO'S ON VHF

the introduction in the U.S. and here in stralia of VFO's specially designed for he 50 and 144 mc/s bands the habit of bout on these bands has come to stay. ually the oscillator runs in the 8 to 9 mc/s ay range and is usually connected to the locket of the regular transmitter. The oscillator tube acting as a multiplier. There nuite an amount of opposition to this type ution on the VHF's.

bands are the final refuge of amateurs nt to talk to one amateur at a time with- crowd else climbing on the frequency. bty is not easily obtained especially at 144 th an 18 times frequency multiplication the VFO's for the VHF's are good for telephony but for CW work they ow up with a chirp or a rough note. RF is often a problem at these frequencies t amateurs prefer crystal control for these

r news is available on 50 mc/s activity he summer F2 layer DX peak. KL7AUV 65 contacts outside Alaska during the He worked with VE's, KH6's, 30 JA's tacted 36 of the 48 U.S. States. st 9 W4AC's for 50 mc/s operation were for contacts made during the period. 4 W6 stations, 2 to W9's and 3 to W One other W contacted all six continents waiting QSL's.

Vern Kerr VK4LK and Reg Stockman, VK2ATS, are again working JA's on 50 mc/s and it augers well for more openings later in the year.

It is reported that the MUF will be up past 50 mc/s by November and it is hoped that it will extend further south to allow VK2, 3, 5 and 7 some DX working. The VK4's were the only amateurs to experience consistant openings for DX last summer.

Another link in the 144 mc/s statewide net has been forged with Reg Stockman, VK2ATS, of Inverell and Bob Wilkins, VK2WQ, of Grafton exchanging signals over a 110 mile path. Activity in the North Eastern part of the State is high with many Z call stations active on the band.

NOTES FROM THE U.S.

THE W's lost their 11 metre band from September 11, and these frequencies are now left to diathermy machines and the like.

Other suggestions for regulatory changes include one from the ARRL to extend full operating privileges to maritime mobile operators plying between U.S. ports. This will allow operation on any band, not restricted to certain frequencies as at present.

The FCC proposes to amend the regulations so they have the power to reexamine certain amateurs. These include Novice, Technical, and Conditional Class Licensees, whose tickets are issued by mail order examination. The Commission reserves the right under the proposed regulation to examine any of these amateurs at centres controlled by FCC examiners.

RTTY amateur transmitting stations are very active in the U.S. WOPB has come forward to gain a WAS award for radio printer operation. Boyd produced the required 48 cards endorsed, "your RTTY signals worked." He has now worked 13 different countries using radio printer operation.

September QST carries the story of a number of power checks made on U.S. amateur stations during the last ARRL DX contest.

A number of well-known amateurs were recorded using inputs in excess of the licensed 1 kw. Several have had their licences cancelled for varying periods, and their calls erased from the DXCC Honour Roll.

The editorial really chastises the users of "corn-fed Californian" kilowatts.

I.G.Y. OBSERVATIONS

AMATEURS are co-operating by making further observations to assist scientists in their IGY work they will concern reporting on "ghost satellite" signals observed on previous Russian satellite orbits. The "ghost" or antipodal signal appears for about three or four minutes when the satellite is approximately halfway round the world with respect to the observer. The signal reappearing when the position is approximately line of sight.

Amateurs interested should listen either plus or minus 53 minutes from the time of a close pass. Previously the ghost signal has been heard at better strength during the evening hours and has been observed on approximately 50 per cent of the days when satellites have been in orbit.

U.S. amateurs are recording days on which signals are heard, direction of arrival of signal (fixed with a 14 Mc beam when available) and signal strength.

Some 60 G radio amateurs co-operated in the RSGB's IGY program providing reports on propagation conditions. A large amount of preliminary work was necessary before the project swung into operation in August, 1957. A 50-page duplicated book was distributed to many amateurs, special reporting forms were also supplied to ensure all reports received were of a uniform nature.

The RSGB's project received no financial support as did the ARRL scheme.

Lack of finance by necessity limited the program to some degree, but individual amateurs co-operated fully and a wide field of observations were covered. They constituted the following headings:—

Study of HF band trans-auroral path propagation.

VHF ionospheric propagation 50 Mc/s.

VHF tropospheric propagation in the amateur 70, 144 and 435 Mc/s bands, also on the TV and FM BC channels.

VHF auroral propagation on 144 Mc/s

SOLAR NOISE

Collation of VHF propagation to meteorological conditions. Study of radio signals from the artificial earth satellites.

The official observers provided many reports on the above phenomenal and much useful data has been accumulated. Main work on satellite recording has, and is, being performed on the Russian Sputniks. Signals from the American satellites have been recorded, but they pass too far south for a full scale recording project.

With granting of 1 kw input permits to a number of G stations for operation on 145.6 and 145-8 Mc/s early co-operation with W2CXY of New Jersey on the Atlantic crossing is expected. Building suitable equipment is taking time and high power VHF gear is not readily available in Great Britain.

Some time ago, news came through that 4S7 amateurs in Ceylon had their licences cancelled. Since that time, due to the operating of unlicensed stations abusing the authorities over the

(Continued on Page 115)

NEW RULES FOR VK-ZL CONTEST

THE annual VK/ZL DX Contest is conducted as the combined effort of the national societies the WIA and NZART. This year the event will be run by the New Zealand Society.

Scoring for VK and ZL stations has been varied this year and should make the contest more interesting. The following is a summary of the rules of the 1958 event:-

Dates: Telephony Section — 24 hours from 1000 hours, G.M.T. Saturday, October 4 to 1000 hours G.M.T. Sunday, October 5.

CW Section:- 24 hours from 1000 hours, G.M.T. Saturday, October 11 to 1000 hours, G.M.T. Sunday, October 12.

There are three sections (a) Transmitting Phone, (b) Transmitting CW, (c) Receiving — Phone and CW.

No cross-band operation permitted.

Only one contact per band is permitted with any one station for contest purposes.

Only one licenced amateur is permitted to operate any one station under the owners callsign. Should more than one operator operate any one station separate logs must be submitted.

The usual serial numbers must be exchanged before points can be claimed. RS plus three figures for telephony and RST plus three figures for CW.

Scoring for VK/ZL stations:- Five points for each contact on a specific band with an overseas station and in addition for each new country worked on the band.

Bonus points on the following scale will be added: 1st contact 50 points, 2nd 40 points, 3rd 30 points, 4th 20 points, and 5th 10 points.

For this purpose the ARRL countries list will be used with the exception that each call area in the U.S.A. will count as a scoring area.

Logs: Must show in order date, time in G.M.T., call sign of station worked, serial number sent, serial number received, band of operation, contact points and bonus points. A separate log should be used for each band.

The summary sheet must show call sign, name and address in block letters, and the score for each band by adding contact and bonus points and the total score by adding band scores together.

Details of the equipment used — receiver, antennas, transmitter and power used should be supplied.

The usual declaration about abiding with the rules and spirit of the contest must be provided.

Certificates will be awarded by the NZART to the top score in each VK/ZL district and the top scorer on each band.

Entries from VK-ZL stations must reach NZART, Contest Manager, ZL2GX, 86 Lytton Road, Gisborne, N.Z., before December 20, 1958.

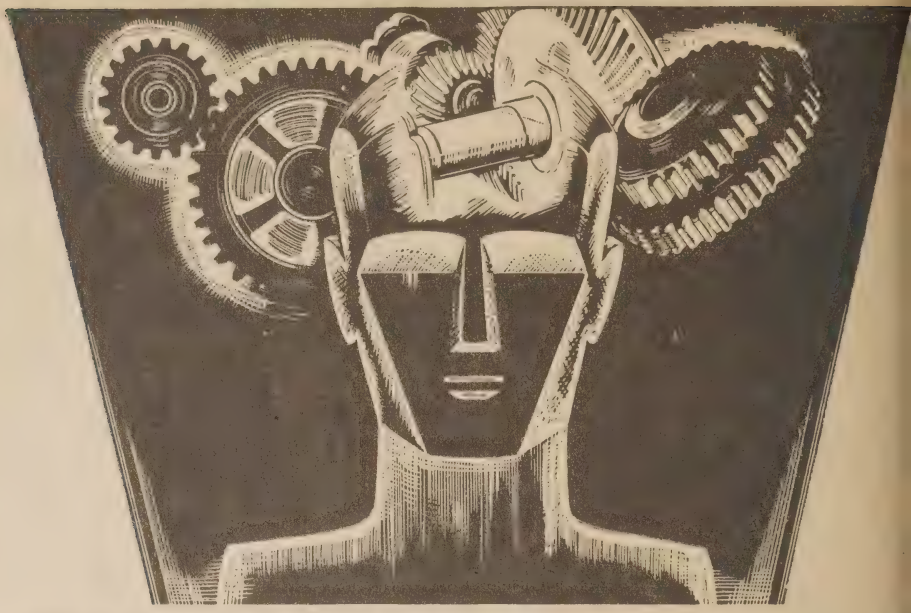
Receiving Section:- Rules same as for transmitting section. Logs should take same form but will only show the call sign of the station heard and the number transmitted by it.

It is not sufficient to log a CQ.

VK receiving stations may log overseas and ZL stations, while ZL receiving stations may log overseas and VK stations.

Certificates will be awarded to the highest scores on the same basis as for the transmitting stations.

The Mechanism of Mind



WHY YOU ARE AS YOU ARE—

and *What You Can Do About It!*

DID you ever stop to think *why* you do the things you do? Have you often—when alone—censured yourself for impulsive urges, for things said or done that did not truly represent *your real thoughts,* and which placed you at a disadvantage? Most persons are *creatures of sensation*—they react to instinctive, impelling influences which surge up within them and which they do not understand—*or know how to control.* Just as simple living things involuntarily withdraw from irritations, so likewise thousands of men and women are content to be motivated by their undirected thoughts which haphazardly rise up in their consciousness. *Today you must sell yourself* to others—bring forth your best abilities, manifest your personality, if you wish to hold a position, make friends, or impress others with your capabilities. You must learn how to draw upon your latent talents and powers, not be bent like a reed in the wind. There are simple, natural laws and principles which—if you understand them—make all this possible.

For centuries the Rosicrucians (not a religious organization) a world-wide movement of men and women devoted to the study of life and its hidden processes, have shown thousands how to probe these mysteries of self. Renowned philosophers and scientists have been Rosicrucians—today men and women in every walk of life owe their confidence and ability to solve personal problems to the Rosicrucian private, *sensible* method of self development. To learn what the Rosicrucians can do for you regardless of your present position in life, send TODAY for your free copy of the book, "The Mastery of Life." There is no obligation. Please address your request to Scribe A.G.C.

The ROSICRUCIANS (AMORC) Box 3988, G.P.O., Sydney, Australia

ime Minister directed that all trans- ipment be seized. It appears it will time before the 4S7 prefixes are heard

rating certificate is now being ex- i family basis. The latest is a "grand- rtificate" issued to any amateur who or more YL operators who are grand- great-grandmothers. Requirement is ie stations worked and their frequen- W9RUJ, who will issue the award.

CTOBER EVENTS

get the two scrambles to be held on tober 5. The South-western Zone's onvention event will be conducted be and 10.30 a.m., the second the Hun- event between 4.00 and 5.00 p.m. able/mobile station in the field will to make as many contacts as pos- p a look out for them. event scheduled to take place during the Field Day of the Blue Mountains the W1A. The venue, Catalina Park, and the date, October 26. Katoomba, of one of the most scenic areas of ttracts many thousands of cars each They should carry a good complement s that Sunday. feature of the field day will be a our. ection of all the beauty spots during on should appeal to all the YL's and sent. on takes place between 10.00 a.m. a.m. The 144 Mc/s Hidden Trans- , 10.30 a.m. to 11.30 a.m. VK2WI 1.00 a.m. will be linked to Dural F's. the blindfold 144 Mc/s hunt will be n the morning and the finals between und 4.00 p.m. 0 to 3.00 p.m. 144 Mc/s and 7 Mc/s will be run simultaneously. ucted Bus Tour of the sights will run to 4.00 p.m., and at 4.15 p.m. prize s and farewells. s and drinks will be free for the chil- prizes lucky numbers, and cups will l for the field events. Remember Oc- nd keep it free for the trip to the tains. Syd. Williams, VK2AVK, will ommodation if required.

N.S.W. WICEN

August the N.S.W. WICEN organi- ducted their first Sydney metropolitan ng VHF and HF mobile stations, plus control station. The latter was VK2WI where State WICEN controller Bob K2ARG, and station engineer Dave O, manned the station. ions were located in the city and coun- cluded Jim Cummings, VK2PM, Sydney; e, VK2MZ, Blue Mountains; and Hugh VH, Forbes. eld, Bob Lear, VK2ASZ, operated on vhile on 144 Mc mobile units were Bob Winch, VK2QA, Dick Norman, Phil Card, VK2ZBX, John Lark, nd others. originated by VK2WI were handled ations to the mobile units, and replies a the same route. The tests provided on of the value of mobile stations in orking, and how such stations could integral part of net organisation. .W. Division provided another field on in August, when they displayed dio operation to members of the Boy their camp at National Park. Rover the central-western metropolitan area, ers from Gosford and Newcastle, were ce at their 12th Rovers Moot. Bob Godsall, VK2ARG, Bob Lead, Dick Norman, VK2ZCF, Perc. Healy, Phil Card, VK2ZBX, and Harry Lap- K2HL, spoke of the Amateur Radio and demonstrated 7 Mc and 144 Mc ts. rked back to official station VK2WI. lc WICEN communicator was also in John Scully and Stan Vale, scout offi- nged the demonstration. Displays of to interest youth groups are extremely to ensure that newcomers can be at- the movement.

O.C.P. CLASS

W.I.A., Victorian Division. .P. Class will commence on day, 6th November, 1958. e and Regulations are held on day and Theory on Monday ngs from 8 to 10. Persons us of being enrolled should nunicate with the Secretary., Victorian Division, 191 n Street, Melbourne. (Phone 087 from 9 a.m. to 4.30 p.m.) e Class Manager, on either of the above evenings.

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Think of

"NOVA"!

NOVA

AMPLIFIERS for DISC and TAPE Recorders, Decks and Heads

"NOVA" TAPE RECORDERS:—

"STUDIO" 3 Speed 1 7/8, 3¾ and 7½"/sec. 3 motors. 2 or 3 Heads, single ended, 4-watt or push-pull 10-watt, Magic-eye or Meter Level Indicator. Place finder. Single Knob Control. 15"/sec optional.

"SONIC-MIDGET" A REVOLUTIONARY DESIGN OF AN EXTRA LIGHTWEIGHT HI-FI RECORDER AUSTRALIA HAS BEEN WAITING FOR. 3¾in sec, 5¾in Reels (1,200ft). Two tracks. 14lb weight, place-finder, 12in x 9in x 6in.

★ Simple and efficient ONE-KNOB tape Control. No spilling of tape ★ 40 second Fast Forward and Rewind ★ "Differential Brakes ★ Counter, Place-finder (Built-in) ★ GUARANTEED Frequency Response ★ 1-year written guarantee.

Commercial pre-recorded tapes and tapes from broadcast stations will play perfectly, as "Novatape" recorders are fully designed to C.C.I.R. standards.

Write today about "NOVA'S" **"ON APPROVAL"** scheme, which will enable you to obtain our equipment for a FREE test without obligation to buy.

"COLLARO" TAPE-DECKS MK III

with or without Pre-amplifier, complete Amplifier

These are also available separately or can be fitted to decks supplied by customer.

All coils for amplifier for above.
OUR COLLARO AMPLIFIER HAS SWITCH FOR 3-SPEED COMPENSATION. A "MUST" FOR GOOD REPRODUCTION.

BARGAINS:—

NOVA: TYPE A RECORDER, 2-speed, 1st class condition, £70.
COLLARO: (2 only). New, slightly scratched panel, £39/15/-.
AUROVOX: 1st Quality Tape, 1,200ft reels, 45/6 ea.

New: TRANSISTORIZED INTERCOM

Easiest to install, many months operation from one battery. In highly attractive SWEDISH STYLE Wooden Cabinet Includes ONE STATION RADIOTUNER.

ULTRALINEAR O/P TRANSFORMERS

FOR EVERY TPYE OF VALVE. "Nova" pioneered "Ultralinear" in Australia.
UP to 12 WATT (2 impedances), £4/17/6. Up to 20 WATT (2 impedances), £6/3/-.
Other types on application.
O/P Transformers for Playmaster 1 to 11 and for the Mullard 3-3, 5-10 and 20-watt Amplifier Transformers Kit Sets.

TV TRANSFORMERS for R. and H., Philips, A.W.A. circuits.
TRANSISTOR TRANSFORMERS for all circuits.
TRANSFORMERS ON MU-METAL, RADIO METAL and C-CORES

REWINDS and any type transformers or coil to customer's specifications. Call, ring or write for quote on your needs.

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CANBERRA: CANBERRA ELECTRONICS, 4 Lansborough St., Griffith, A.C.T. X1324.
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SUPPORT AUSTRALIAN MADE PRODUCTS AND ALSO HAVE NO SERVICE OR SPARE PARTS WORRIES

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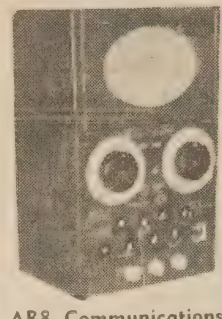
EVENINGS and WEEKENDS: "KALUA," Hilma St., Collaroy Plateau — XW59

DULWICH HILL, UNDERCLIFFE, EARLWOOD, BUS AT DOOR, STOP No. 42.



AR8 Communications Receivers

12 valve. Converted to 240v. A.C. Thoroughly Tested. Re-aligned. Latest Oyaltone Permag. Speaker

£34/17/6

NEW RESISTORS

100 assorted. 40 Values.

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Postage 2/6.

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Series wound Hi-speed miniature. 12,000 R.P.M. £2/10/0.

Shunt wound with gear box. 2 speed and 5 and 25 R.P.M. £2/10/0

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£1/7/6

With Dynamic Earpiece and Microphone.

£2/5/-

Throat Mikes, New 3/6
12v. 420 watt Prefocus Globes. 7/6

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Suitable for TV Pic. Tubes.

VCR 139A	2¾in	£1	10 0
VCR 138A	3in	£1	7 6
VCR 97	6in	£2	17 6
511		£2	10 0

913. Delivery Aug., 1in Min. CRO £1 12 6
5FP7 Flying Spot. 5in 17 6
CV112 £1 5 0

NEW 3BZ TRANSMITTERS

12v operation. 2 to 10 Megs. Air tested. Perfect order. Complies with P.M.G. requirements. For small ships, bushfires and all other services.

COMPLETE WITH 1 CRYSTAL.

£32/10/-

TRANSCEIVERS

No. 11 less valves and meter. £3.
No. 11 including valves and meter. £4/10/-.

No. 19 less valves and meter. £3.
No. 19 including 15 octal valves and 500 micro amp. meter. £5/15/-.

N.B.: All these units are in excellent condition. For original use parts or conversion.

WALKIE TALKIE

American No. 536 Transceivers Complete with Valves.

£4/17/6

NEW HIGH IMPEDANCE HEADPHONES

£1/10/

Postage 2/6.

AR8-AT5—COMPLETE STATION

AIR TESTED

Transmitter-Receiver. Aerial Couple Cables, Plugs, Phones, Mike. 1 Crystal to desired Frequency. 24v. Power Supply and Circuits of 2 units.

GUARANTEED IN PERFECT ORDER.

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Other voltages available.

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Johnston 300 watt direct coupled to 1 H.P. petrol engine. Tested. Perfect order.

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12C8	.. ..	12/6	6K7	.. ..	5/
6J8	.. ..	17/6	12SH7	.. ..	12/6
VT501	.. ..	12/6	12SK7	.. ..	5/
2D21	.. ..	15/	12SL7	.. ..	12/6
6L6	.. ..	20/	39/44	.. ..	10/
1C6	.. ..	12/6	46	.. ..	12/6
1J6	.. ..	12/6	47	.. ..	12/6
1P5	.. ..	2/6	78	.. ..	12/6
6A6	.. ..	12/6	828	.. £2	10
3A4	.. ..	15/	843	.. £1	10
3B7	.. ..	10	957	.. ..	10/6
3D6	.. ..	10	1625	.. ..	£1
6AG5	.. ..	7/6	1629	.. ..	10/
6AM5	.. ..	15/6	4307A	.. ..	10/
6AM6	.. ..	17/6	1619	.. ..	£1
6J6	.. ..	2/6	2050	.. ..	£1
6J6	.. ..	15/	9001	.. ..	8/6
6J7G	.. ..	7/6	RK475	.. ..	10/
6N7	.. ..	10/	VR75/30	..	15/
12A6	.. ..	2/6	RK48A	.. ..	£3
2A3	.. ..	£1	954	.. ..	7/6
KT/W62/6U7		7/6	VR105/30		15/
1M5	.. ..	7/6	1C7	.. ..	2/
1D5	.. ..	7/6	1A5	.. ..	7/6
CV6	.. ..	3/6	7193	.. ..	3/6
6F6	.. ..	12/6	6G8	.. ..	15/
VR65A/SP41		2/6	6B8	.. ..	12/6
KT66	.. ..	27/6	807	.. ..	15/
806	.. £3/10/		EL3NG	.. ..	12/6
6X5	.. ..	10/	83	.. ..	10/
6V6	.. ..	12/6	EM1	.. ..	12/6
1Q5	.. ..	2/6	866A	.. ..	15/
811	.. ..	10/	6AC7	.. ..	2/6
6E5	.. ..	12/6	EF50	.. ..	2/
6BM8	.. ..	17/6	100TH	.. ..	10/
12K8	....	12/6	5R4GY	.. ..	£1
1T4	.. ..	10/	6AJ5	.. ..	9/6
3S4	.. ..	10	EA50	.. ..	2/6
1L4	.. ..	7/6	1K5	.. ..	7/6
VT502		12/6	6C4	.. ..	7/6
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NEW AIRCRAFT AIR COMPRESSORS

Complete with Filter. Hi-speed. Ball-bearing. 2 cu. ft. per minute. Ideal for small spray gun, etc.

£3/17/6

New Microswitches 6/6 each

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240V AC, 1/20 h.p. Motors

Series wound. 7,000 r.p.m.

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300 x 300 100 6v. . £1 17 6
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6v., 240v. 30 watt . £3 7 6
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350 x 350 extended to 1000v.
6.3v., 6.3v., 2.5v., 4v. . £4/8/-.
Postage: N.S.W. 5/-; Interstate 7/6

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295 x 295 300mA £6 15 0
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12 amp Fils £8 5 0

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240V-50V Primary.

1500 x 1500	750MA	£10 10 0
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RELAYS

6v. 3-Pole Miniature 15/-
1700 SPDT 7/6
1300 SPDT 7/6
500 x 500 SPDT 7/6
12 volts DPDT 5 amp £1
12 volts DPDT 12/6
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Hi-speed Polarised relay. £2/10/-
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¾in Square Section DURAL TUBING UP 24 12ft lengths, 1/- per ft.
Hi-lo Phono Transformers .. 4/6
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Hydrometers. Battery Testers 5/9
Torches, 2-cell, Focusing . 6/9
Multi-Strand 4-core Cable, yard, 1/-
100 yards £2/17/6
Tx Var. Condensers. 300 pf. £1/5/-.
100 pf. £1/1/-
60 pf with Vernier £1 1/-
30 pf 10/-

B.C.348 RECEIVERS

New condition. Complete with 11 valves.
Crystal Gate. 200 Kc. to 18 Megs.

£37/10/-

NEW Indicator Unit

for that C.R.O. Project.
3 valves. VCR139A CR Tube. Cabinet Socket Mount for Tube Pots, etc.

£3/10/-

Marconi R107 Receivers

6v DC and 240AC Operation. 1.2 to 18 Megs.

Built-in Goodman's Speaker. 8-valve New condition Communications Receiver.

£29/10/-

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8-day movement. Cost Govt.
2¾in £4
2¾in with sweep hand £5

New Coils and Intermediates

Standard or miniat to suit all valves

Coils B/C 455 KC .. ..
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Slug tuned H.F. coils to sp meg. .. .. ..

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Input.	Output.	
24v.	250v. 100mA ..	£1
24v.	550v. 375mA	£2
24v.	250v. 60mA	£1
12v.	500v. 350mA	£3
12v.	1200v. 200mA ..	£6
24v.	250v. 100mA. New	£2
12v.	235v. 50mA ..	£2
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Bendix 522 Transceiv

Complete with 17 valves. Good condition.

£16/10/-

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Standard P.M.G. type. Pedestal Magneto Phones, teste perfect order.

£6/10/-

RECORDING TAP

E.M.I. Hi Coercivity Tape Ex-A.B.C.

3250ft	Platters	£2
2200ft	Platters	£1
1200ft	Spools	£1
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TRANSCEIVERS

No. 22. Complete with V Power Supply, Mike, Phones, and Cables.

The addition of Crystals to set conforms with P.M.G. re ments for small ships, bushi brigades.

£12/17/6

WANTED

Communications Receivers.
Equipment, P.A. Gear. Large small surplus stock. Best pri Call, write or phone any ti

Oil-filled Condense

1UF 600V. 6/6 5UF 2.5V
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10MFS 500 7.5UF 330V AC

NEW

American Walky To

Wired and Tested Chassis, including Aerial and S and Circuit. No valves.

19/6

Postage 2/6.

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500 Micro Amp. Met

2½in

£1/15/-

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NEW 12V Generat

550v, 350mA .. £8
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NOW AVAILABLE

Q-PLUS TV KIT

the completed set operating at Newtown Branch.
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PLETE TO THE LAST NUT BOLT, INCLUDNG ILLUS-RATED CONSTRUCTIONAL MANUAL AND CIRCUIT
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UCCESS IS GUARANTEED
PLETE KIT INCLUDING 19 ALVES AND PICTURE TUBE
in—£119/10/-. 21in—£127.
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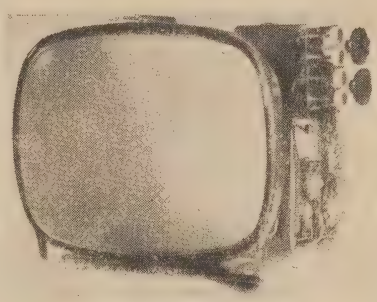
A.C.E. KIT SET

19 Valves

Box Construction or Flat Chassis
6 x 9 or 12in Speaker

Box Construction as illustrated
Provides simplified wiring service Cabinet Fitting or Making.
Construction Manual Provided.
Complete to last nut and bolt
Prealigned Q+ Strip and Tuner



14in. .... £101 17in. .. £105 21in. . £110
Wired and tested £15 extra. Send for full details.

TRANSISTOR PORTABLE

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mplete kit of parts, in-ding Speaker, Transis-s, Plastic covered cabinet
£26/10/-
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Cabinet only £3/3/-

TRANSISTOR TRANSIGRAM

Complete kit including speaker, transistors, 6v. 4-speed BSR Gramo. unit. Plastic covered cabinet — £34/-/-
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B.S.R. 6v-60mA 4-Speed Motors

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£118
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Chassis. Not Polished.
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complete range from
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Complete with Valves and Speakers

5 Valve	£18/15/-
6 Valve	£23/15/-
8 Valve	£28/15/-
7 Valve, 3 band	£29/17/6
10 Valve Hi-Fi	£44/15/-

Mullard 5-10 amplifier
Ferguson O.P. Transformer 301 with U.L. Tags
£28/15/-
Separate control box and RF Amp £6 extra

Mullard 5-20
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6 Valve, 10 watt	£14/17/6
6 Valve, 25 watt	£25/7/6
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6 Valve 6V 10 watt, £18/15/
7 Valve 12V, 12 watt, £19/15/-
7 Valve 12V 25 watt, £24/17/6

BATTERY—AC OPERATION

6 Valve 6 x 240 10 watt, £20/15/
7 Valve 12 x 240 12 watt, £21/15/
7 Valve 12 x 240 25 watt, £29/7/6

Send for full details on Radiogram Chassis and Amplifiers.

TURRET TUNERS

Steanes, Philips, AWA
Mullard, Astor
From £12/15/-

PICTURE TUBES

90 degree

14"	£22/-/-
17"	£24/-/-
21"	£31/15/
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Fully guaranteed

I.F. STRIPS

Complete with Valves
Aligned & Tested
Your pick from Steanes R.C.S., Mahood coils
From £12/10/-

TELESCOPES

30 x 40 coated lens with tripod, suit rifle, clubs, etc., length 28 inches, weight 1½lb.

£7/19/6

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Ex-Army. Ideal. Dumpy Levels, Theodolite, Telescope or Instrument Stand.

£4/10/- each

Freight payable at nearest attended railway station.

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Brand New. Ex R.A.A.F. 0 to 40,000 feet.

£1 each

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COPPER WIRE

BRAIDED.

Ideal Aerials etc.

6/11 per 100 ft.

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OIL PRESSURE GAUGES

New. Suit Cars, Trucks, Boats, Stationary Motors, etc.

0-150lb sq. in.

£1 each

Complete with tubing.

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P8 COMPASS

Liquid filled. As new. Ex-R.A.A.F. Ideal for small boats, etc.

£3/15/- each

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PRISMATIC COMPASSES

Ex-Army. LUMINOUS. Guaranteed Correct.

£7/15/- each

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TV ANTENNA TUBING

12ft. Lengths.

12/- per length

Suggestions supplied free. For simple Antennas with each purchase of tubing.

Sorry, no mail this line.

VOLTMETER

Pocket Size.

0 to 15 volt D.C. and 0 to 250 volt D.C. with probes. In water-proof Canvas Case.

33/6 each

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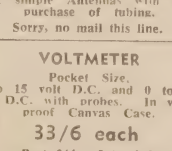
German Field Glasses



Centre focus. Lightweight. Colossal Value,

Only, per pair **35/-**

Large range binoculars and telescopes in stock. Ideal Geophysical Satellite viewing, etc.

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TELESCOPES Ex-Army

Ottway of London.

With variable power adjustments. Length 26in. Weight 12lb.

£12/10/-

Freight payable at nearest attended railway station.

R.A.A.F. TARGET OSCILLATORS

£4/19/6

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(2 WAY RADIO)

Ex-Army No. 22 Set. Air tested. Complete. **£18/10/-**

EX-ARMY No. 128 Set. Air Tested. Complete **£24/10/-**

Good condition without accessories. **£12/10/-**

EX-ARMY No. 19 SET. Good condition. **£7/10/-**

Freight payable at nearest attended railway station.

TWO GANG CONDENSER

Variable. Brand New.

15/- each

Post, N.S.W., 2/6; Int., 3/11

BOWDEN INNER STEEL CABLE

Ideal for brakes, steering, rudder etc.

1/- per yd.

Bowden Outer Cable.

6d per yd.

Minimum 10yd. Please add Post.

BALL BEARINGS

½in-I.D. ⅞in.-O.D.

24/- dozen

Post N.S.W., 1/9; Int., 2/9.

CONDENSERS

A.W.A., .01 5/- doz. Block Condensers, Bakelite. .01 MF 750v DC, 6/- doz. Ducon 400 MFD. 12 P.V., 6/- doz.

Add Postage.

METERS

In Polished Wooden Case and Leather Carrying Case. Siemens, ex-Army.

Dimensions 7in x 7in x 4in

0 to 1 Milliamps A.C.

£5/5/-

0 to 50 Amperes. A.C.

£7/5/-

Post. N.S.W., 6/2. Int., 9/6.

HEADPHONES

High Impedance. Suit Crystal Sets. Lightweight. American

37/6 pair

Post, N.S.W., 2/1; Int., 3/3.

FIBRE PULLEYS (AMERICAN)

BALL BEARING

1 3/8 diam. ¼in shaft, 30 - doz. 1¾ diam., ¼in shaft, 42/- doz. 2 3/8in diam., 3/8in shaft, 54/-. 3½in diam., 3/8in shaft,. 66/- doz.

ADD POSTAGE

AIRCRAFT GENERATOR

24v DC. 100 amp

£17/10/-

Freight payable at nearest attended railway station.

MANIFOLD PRESSURE or VACUUM GAUGE

NEW

£1 each

Post N.S.W., 2/1; Int., 3/3

VALVES

1.4 Miniature Series. New.

1R5 .. .. 12/6
1T4 .. .. 10/-
1S5 .. .. 10/-
3A4 .. .. 12/6

OTHER VALVES. ALL NEW.

GL8020 15/-; EL5 7/6; HA2 Acorn 15/-; H30 Duo Triode 7/6; EB34 7/6; HA1 Acorn 15/-; EF8 7/6; Cathode Ray Tube with socket Type 4/1, new, 29/6; EL 50, 7/6.

Add Postage.

Mechanical REV. COUNTERS

Smiths

New 0 to 2,600 r.p.m.

£4/19/6 each

or complete with flexible drive

£6/15/-

Post N.S.W., 3/4; Int., 4/6.

SHOCK MOUNTS

1¼in. New. Made in U.S.A.

7/6 a doz.

Post N.S.W., 1/9; Int. 3/3.

NEW MAGNETO TELEPHONE KITS

Complete do it Yourself Kit.

62/6 each

or £5/15/- for 2 sets.

Each kit comprises one Ericson Magneto, 1 Beltbell Handset, 1 Battery, 1 Case, 1 Handset Support and one Diagram.

Already assembled Phones

£4/10/- each

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AIRCRAFT MAGNETOS

Contain sundry gears. Coil. Electrical and mechanical parts.

Only 9/6 each

Plus 3/6 cartage.

Freight payable at nearest attended railway station.

CAPACITORS

1 MFDS 350v 2/-
2 MFDS 250v 2/6
4 MFDS 400v 3/-
4 MFDS 600v 4/-

Post N.S.W., 2/3; Int., 3/11.

VARIABLE CONDENSERS

Single Gang. New.

7/6 each

Post N.S.W., 2/1; Int., 3/3.

AMERICAN RELAYS

24v S.P.D.T. 12/6 ea. Miniature.
12v D.P.D.T. 12/6 ea. Miniature.
12v S.P.S.T. 9/6 ea. Miniature
200w T.P.D.T. 17/6.
200 ohm S.P.S.T. 15/-.
Time Delay D.P.S.H. heavy duty
24v Western Elect., A.C. 45/-.
24v D.C. S.P.D.T. 17/6.
24v 200 ohm LEACH. S.P.S.T. heavy duty. 27/6.
200 ohm S.P.D.T. 17/6.
10,000 ohm S.P.S.T. 19/6.
5 and 10 ohm T.P.D.T. 15/-.
28v heavy duty D.P.D.T. 27/6.
Post 1/9.

BENDIX COMMAND MODULATOR

Unit BC-456-E

50/-

Genemotor 35/- extra.

Post N.S.W., 6/2; Int., 9/6.

AIR TEMPERATURE GAUGE THERMOMETER

0-30 minus C 0-50 Plus C. Suit Cool Rooms, Electroplating Works and 1,000 other uses.

£1

Complete with tubing.

Post N.S.W., 2/1; Int., 3/

AIR SPEED INDICATOR

NEW

£1

Post N.S.W., 2/1; Int., 3/

TOGGLE SWITCHES

Two Way, with silver contacts. Ex Command.

4/6 each

Post. 9d.

POTENTIOMETERS

50,000 to 100,000 ohms.

3/6 each

Add Postage.

WHIP AERIALS

Ideal for car or TV antennas blackfish rods. 13ft in 4 sections.

19/6

Post 1/9. Int., 2/9.

TRANSFORMERS

TRANNIES, midget output. 5/-

TRANNIES, I.F., 1600 K cs. 5/-

TRANNIES, ex-Navy can 5/- ea.

TRANNIES, power 0210. 230-250 Prim. 6.3 Amp. Centre tap 5V. 2 Amps. 315-0-315 V., 35/-

TRANNIES. 115V. 40-0-400 .400 V-210-0270-400 V. 3 ment. 35/- ea.

TRANNIES. 115V. to 6.3, Trip 10/- ea.

TRANNIES, Canadian, voltage known, these can be rewound. ea.

TRANNIES, heavy duty 240V., put 6.3V., 5V., 325V. ext., 40 A.W.A., £4/15/- ea.

TRANNIES, Trimax 230 to 6.3, 6.3 at .6 Amp. 6.3, 2 x 6.3 .6 Amp., 6.3 at 10 Amp., 6.3 1.7 Amp., 35/- ea.

TRANNIES, Trimax 230V. prim 5V. C.T. 6.3 285-0-285, 45/-

TRANNIES, Trimax heavy duty secondary, 66/6 ea.

TRANNIES, heavy duty prim 240-V., 1.5 Amp. sec. 22-OK V.O.15 Amp. Rating 0-33 K.V Wind 1 sole above 1 freq. cycle. A.W.A., £10 ea.

Please add postage.

Radio Experimenter

SPECIAL MIXED LOT

2 Potentiometers .1 meg., 3 assorted resistors, values ran from ½ to 2 watts; 9 assorted C densers; 1 Midget Choke, si wound; 1 Midget Choke, do wound; Output Transformer; 2 I Transformers; 1 H.F. Reacti Ceramic; 1 hank of ass. Hoo Wire, approx. 40ft; 3 lengths Multi Core Cable, and lots of o items too numerous to list.

THE LOT 45/-

Post N.S.W., 3/9; Int., 8/2.

TELEPHONE CABLE

BRAND NEW, NYLON COVER

£4/17/6 per mile

Freight payable at nearest atten railway station.

DEITCH BROS.

70 OXFORD STREET, SYDNEY

Between Crown a Riley Streets. C

RE'S YOUR SWER TOM!

ontinued from Page 47)

y not be noticeable while, in may be drastic as you have ob-

ic example concerns the old erter valve. This had only two s as the oscillator anode and asy to deflect the electron way, from these so effectively riode section ceased to oscill-

other hand, a valve with long placed symmetrically around de would show very little re- reduction in plate current in being compensated by a rise

e wattage rating is not ex- does the value of current in a resistor matter?

d the wattage rating of a re- ot exceeded, it does not matter e of current is flowing through number of voltage and current ons will give a set wattage dis- gure.

a 1-watt resistor, for example, it et any hotter if it is called upon e one watt which is a product rrent and high voltage than if e product of a high current and ge.

hount of heat dissipated in a ay be calculated from any two llowing factors: its resistance, nt flowing through it and the rop across it. As the current he resistor increases so must and the voltage drop across it n order that it will still dissi- watt.

is second channel interfer-

channel interference is the re- a superhet receiver of a second on which happens to be sepa- n the desired signal by a fre- lifference of twice the inter- requency of the receiver.

a practical example, we sup- the IF of the receiver is 100 n, to receive a station on 600 receiver oscillator would norm- et to 700 Kc, which will give red heat frequency of 100 Kc. this will also give the same heat with a transmitter on 800 Kc atter might be heard as an inter- nal.

pe of interference may be mini- rtly by using a high order of ate frequency and partly by the of adequate selectivity in the es of the receiver.

t is meant by the term "a lve"?

valve, Tom, refers to a valve in e amount of gas is sufficient its rated electrical characteris-

actice, valves are nominally hard-vacuum" or "gas-filled" soft valve is a term used to a valve which was manufactured d-vacuum type but which now free gas molecules, either re- om the electrodes or else ad- the envelope through a minute ft valves are frequency charac- a milky blue or violet glow reads around on the inside of ope.

XMITTER FOR MOBILE AMATEURS

(Continued from page 43)

ance low enough for the connecting lead to be run in the same cable as the modulated high tension lead going from the power unit back to the 2E26 without mutual interference.

Output from the cathode follower is rectified, filtered and fed back to the grid of the EF86 as AGC bias. A series diode is included in such a way that the AGC acts quickly on a sudden loud signal but recovers slowly. An amplitude delay is introduced by returning the rectifier diode to a positive potential.

In the original transmitter, 12 volts delay and average speaking conditions kept the modulation around 100 per cent but we suggest that you check with a CRO while varying the delay voltage. The LT line is a suitable source and a divider can be used if an intermediate value proved to be desirable. A variable gain control is not required.

DRIVER VALVE

A valve with a low source impedance is required to drive the 6N7-GT class B modulator. A 6V6-GT as a triode is excellent in this respect. It has a low heater consumption and audio power to spare.

In a DC sense, it is in series with the EF86, 12AX7, 6AU6 and 5763 with the object of saving some of the high tension power which would otherwise be wasted by separate dropping resistors. It has about 250 volts between plate and cathode and 150 volts between cathode and heater, the latter being well within ratings. In an AC sense, it is separated from the rest of the transmiter by a 16 uF bypass.

A 6N7-GT is a high-mu twin triode specially designed for zero bias class B service and should not be confused with the 6SN7-GT which is quite unsuitable for this application. However, you could use types 6N7 or 6A6.

The highest voltage recommended by the manufacturers is 300 when the valve is rated to deliver 10 watts under zero bias conditions.

We are exceeding the ratings by applying 400 volts but have had extensive experience with this valve and have found it to be most reliable under the 400 volt condition. Standing dissipation is reduced by returning the cathode to a 6 volt positive point (6V negative grid bias) and the internal insulation of the valve appears capable of withstanding the extra pressure. Peak audio power is sufficient to modulate up to 30 watts input to the plate of the 2E26.

The driver transformer should have a step-down turns ratio of from 1.5:1 to 2:1 primary to full secondary, while the modulation transformer should be designed to match approx. 10,000 ohms CT to 6,000 ohms, bearing in mind the DC component in the secondary. The originals from a wrecked 122 worked well, but suitable transformers are available on the ordinary market.

We do intend to try a high level clipper/filter circuit before long and may be able to pass the relevant information on to readers. If a variable ratio modulation transformer, it may be possible to increase the load to the 6N7-GT to the point where it cuts off in a low voltage high current condition and thus serves as an automatic clipper. Only a filter is then needed to prevent high frequency components from being radiated.

Sound from the genemotor was attenuated by mounting it on rubber inside the power supply box. It was then found that the box could be bolted directly to the car body without excessive sound being transmitted to the passenger compartment.

STARTING RELAY

A very heavy relay is required to handle the starting current of the machine. If there is not to be an excessive delay in the armature coming up to speed, resistance in the LT circuit should be cut to a minimum. Actual running current under full load can be handled by relatively thin conductors.

Finally, many modern cars do not include an ammeter, and with extra drain on the battery it is particularly important to watch charge conditions. Given a suitable switching circuit, the meter in the transmitter can be used for this purpose. A special shunt can be installed between the car circuits and the battery (not including the starter motor), or you may find a suitable cable across which you can tap. Calibration can be carried out by adjusting a series multiplier. Values of all shunts and multipliers will depend on the characteristics of your particular meter.

THE SERVICEMAN WHO TELLS

(Continued from Page 79)

he arrived. Equally impracticable is any suggestion of his keeping the set under observation until it failed, due to the long period between failures.

Since it is hard to explain all these things to a non-technical customer, the latter finishes up very dissatisfied with the serviceman's work, or the serviceman finishes up losing much money and sleep trying to maintain the customer's goodwill. And if he doesn't find the fault, the customer is dissatisfied AND the serviceman loses money.

Nor can the valve manufacturers be of much assistance, since they have no magic facilities for detecting an elusive intermittent condition. If a tube tests OK and shows no fault after a few hours of test run or switching on and off, they have no alternative but to pronounce it good. They can't get inside the tube to check for faulty welds any more than the serviceman can — that is, without opening it up and ruining it for all time.

It would be like killing a patient and conducting a postmortem to ascertain whether the condition they are suffering from can be cured!

The only solution I can suggest is to leave the set in operation, "servicing" it feminine style, until it finally fails completely and the trouble can be anaylsed. Not a very satisfactory approach, I admit, but can anyone suggest a better one?

And, as I said at the beginning, there is not even the satisfaction of being able to blame anyone for the situation — unless, perhaps, it is the tube manufacturer.

VALVE SPECIALS! 50,000 New Valves To Cle

12 for - - - 20/-	1P5, 1Q5, 1L4, 1K5, 1C7, 6H6GT, VR65A, 7193, EF50, 954, 955.
8 for - - - 20/-	6SH7, 6AC7, 7C7.
6 for - - - 20/-	6C8G, 12SK7, 12SP7.
4 for - - - 20/-	6U7G, 6J7G, 6SS7, 7C5, 2X2/879, 84, 1T4.
3 for - - - 20/-	EK32/VR57, EL32, 6K8G, 6K7GT, 3S4, 1S5, 1R5, 6AG5.

Post &
Packing
4/6 extra

ALL VALVES ARE NEW AND MOSTLY IN INDIVIDUAL CARTONS

FOR THAT C.R.O. or TV SET

		POST FRAGILE RATE
NEW 5BP1	37/6	NSW 11/- INT. 15/-
902	32/6	NSW 5/- INT. 8/-
915	22/6	NSW 2/- INT. 2/6

5BP1 CERAMIC SOCKETS 5/6

TRANSMITTING VALV

809 _____ 1
100 T.H. _____ 1
803 _____ 2

Post Extra

RADAR RECEIVERS

These radar receivers type ZC955 contain 16 valves and a 30 Mc. I.F. strip suitable for your TV experiment. Units are in new condition.

£2/17/6

Packing 15/- extra.

NEW DYNAMIC HEADPHONES

These headphones made by Rola are a high-quality unit giving excellent tone. Fitted with comfortable ear pads.

25/- Post 4/6.

INDICATOR UNITS

These indicator units contain V.R.C. ACR/10 C.R.O. tube and socket. Ideal case for the small scope.

(Used, fair condition.)

30/-

F.O.R.

24 Volt Midget Motors Shunt Wound

Fully Laminated Fields. Wond Armature. Sixteen Segment Commutator, ball bearing. Ideal for Model Trains, Hobbyists, etc. Condition new. Price, each

25/-

Packing and postage: N.S.W., 1/6; Interstate, 2/6.

COMMAND EQUIPMENT

RECEIVERS

3-6 Mcs or 6-9 Mcs WITH VALVES.

55/-

TRANSMITTERS

WITH VALVES AND CRYSTAL

55/-

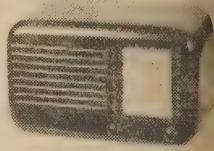
4 equals 5.3 Mcs., or 5.3 equals 7 Mcs.

MODULATORS WITH VALVES

25/-

Post extra on Command Equipment.

MAKE UP THE "LITTLE GENERAL



£12/17/6

Complete kit of parts for the 1957 "General" as featured in R. and H., in attractive bakelite cabinet with slide Price includes valves and Rola 5F Speak kit is complete to the last nut and bo wired and tested £2/15/ extra.) Cabinet size 11½in long, 7in high, 6in Foundation Kit for above comprising R Cabinet, Chassis and Dial Assembly ..

Post and Packing: N.S.W., 14/ Interstate, 25/-.

RADIO ALTIMETE APN.1

These units contain valves, r genemotor (24v) and Wobulato used in the R. and H. sweep marker generator. Also many useful parts.

£4/17/-

F.O.R.

No. 22 TRANSCEIVERS

The 22 transceiver covers a frequency of 2 to 8 Mcs., and has been approved by the P.M.G. for use on fishing boats, small craft, bush fire brigades, etc., if converted to crystal control, for which it is easily arranged. These sets are supplied complete with valves, 12v. vibrator, power supply, dynamic headphones and microphone leads.

£12/17/6

F.O.R. PACKAGE 15/- EXTRA.

No. 19 TRANSCEIVERS

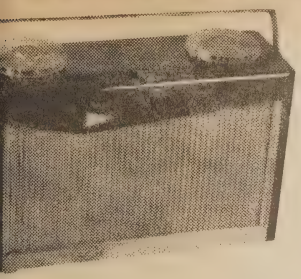
These units cover a frequency of 2 to 8 Mcs. and contain 15 b valves, including 1-807, 2-6V6, 6-6K7, 2-6K8, 6B8, etc., al microammeter.

Units supplied complete with valves, leads, junction box, gen power supply and dynamic headphones and microphone operati 12v. supply.

£7/15/-

METROPOLITAN RADIO SUPPLIES

332 PARRAMATTA ROAD, STANMORE, N.S.W. PHONE LM73
640 KING STREET, ST. PETERS, N.S.W. PHONE LA60



MAKING R. & H. TRANSISTOR PORTABLE ?

COMPLETE KIT OF PARTS

£26/10/-

POST EXTRA

SET WIRED AND TESTED £2 EXTRA

INCLUDING 6 S.T.C.TRANSISTORS, R.C.S. COILKIT WITH PRINTED CIRCUITS, ROLA TRANSFORMERS AND 5F. SPEAKER & ALL PARTS NECESSARY TO COMPLETE THIS SET INCLUDING ATTRACTIVE & DURABLE TWO-TONE PLASTIC COVERED CABINET.

SPECIAL PURCHASE—HI-FI AT LOW COST

VALVE DUAL WAVE HI-FI CHASSIS WITH DUAL SPEAKERS AND LATEST COL ARO 4-SPEED RECORD CHANGER WITH CRYSTAL PICK-UP. THE TWO UNITS

ESE NEW 7-VALVE HI-FI CHASSIS USE THE LATEST PHILIPS 9 PIN VALVES IN-UDING THE DUAL-PURPOSE 6BM8 VALVES IN PUSH-PULL OUTPUT.

TH EM80 "MAGIC EYE" TUNING INDICATOR, SEPARATE BASS, AND TREBLE CON-OLS, ATTRACTIVE PLATEGLASS DIAL AND SUPPLIED WITH JENSEN M.S.P. DUAL EAKERS, 12in WOOFER AND 6in TWEETER.

£39/17/6

F.O.R. Packing 10/- extra.

NEW VALVES AT BARGAIN PRICES

IC4	7/6
D4	7/6
L4	4/6
T4	10/
S8	10/
S4	10/
V4	12/6
R5	12/6
A7GT	9/6
D8GT	9/6
A8G	10/6
K8G	9/6
SJ7GT	9/6
X5GT	10/
2K8	10/
2SK7	7/6
K32	10/6

6SA7GT	9/6
6SH7	5/6
1Q5G	5/
1P5G	5/
1C7G	5/
1K5G	2/6
6AC7	2/6
6C8G	7/6
6SS7	8/6
6H6	2/6
6H6GT	1/6
6J7G	7/6
6K7G	3/6

6K7GT	7/9
6U7G	6/6
6J7G	5/
6U7G	5/
6J6	15/
6F8G	10/6
6A3	15/
7C7	3/6
7A6	3/6
7S8	7/6
71A	7/6
EL32	10/6
6V6GT	12/6

KTW62/6U7	6/6
VR65A	2/6
15	7/6
41	7/6
7193	3/6
954	2/6
955	10/
12A6	10/
EF50	2/6
110TH	£2/9/
811	£1
866/866A	15/
12SH7	5/
12SL7	10/
6K7G	4/6
100TH	20/

Please add Postage on All Valves.
SPECIAL PRICES FOR QUANTITIES.

EW I.R.C. RESISTORS

. carbon resistors, ½, 1 and 2 watt, lues 50 ohms. to 5 meg., including popular sizes, 3T, 15T, 20T, 25T, 100T, 250T, 500T etc.
dard resistor colour code supplied)

100 for 25/-

(Plus 1/6 postage.)

TV I.F. STRIPS

plete, wired and aligned, supplied seven minature valves.
extra

£14/10/-

RRET-TUNERS £15/-/-

New Micro-Ammeters

New Paton Micro-Ammeters

0-500 mA, 1¾in diameter. Flush mounting.

25/-

Post and Packing, 2/6.

CONDENSER SPECIALS

Boxes of 100 new mica paper and electrolytic condensers in values ranging from 50pf mica to 5 400v paper. Values include .0001, .00025, .00075, .01, .02, .05, .1. Also 500 mfd/12v., 10 mfd/40v., 16 mfd/350v. electrolytics.

25/- per 100.

Post Extra: N.S.W. 2/6; Int., 3/6.

New Power Transformers

60mA prim.: 240v with 230v tapping, Sec. 285 x 285 with 6.3v filament winding, 60mA.

27/6

Plus Postage: N.S.W., 3/6; INT., 5/3.

New Midget Power Trans.

40mA Prim. 250v Sec. 225 x 225 with 6.3v. Fil. Winding. Upright or Flat Mounting. Size 2in x 2½in.

25/-

2/6 Postage, N.S.W.; Interstate, 4/6.

30mA 240v. Prim. 150 x 150v. Sec. with 6.3v. Fil. Winding.

22/6

Postage, N.S.W., 2/6; Interstate, 3/6.

Please address all correspondence to 332 Parramatta Road, Stanmore, N.S.W.

METROPOLITAN RADIO SUPPLIES

32 PARRAMATTA ROAD, STANMORE, N.S.W.
40 KING STREET, ST. PETERS, N.S.W.

PHONE LM7393
PHONE LA6087

I'm a perfectionist!

I'M ALWAYS SURE OF JOINTS SOLDERED WITH . . .

ERSIN Multicore 5 CORE SOLDER

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COURSE IN TELEVISION

(Continued from Page 99)

n the bias voltages developed in
d return resistors.
r any reason the oscillator tends
v down (Figure 176c), a larger
ion of the rectangular synch.
overlaps the sawtooth. Current
hrough the control valve for a
period, the cathode potential rises,
ive-going bias is applied to the
or grid and the blocking fre-
is increased, thus correcting the
on.
arly, if the oscillator tends for
son to speed up (Figure 176d), the
the synch. pulse misses the peak
sawtooth, current flows through
ntrol valve for a shorter period
e cathode voltage falls. This re-
he "positive" bias on the oscil-
hereby lowering its blocking fre-
and again correcting the condi-

IN LOCKED

ther words, once having locked
synch. pulses, the oscillator and
tube tend to retain the condition
tely.
general circuit arrangement is
nly referred to as the "synchro-
or, considering the use of the
ve coil explained earlier, as the
ed synchroguide."
important point behind the whole
is that the cathode bias voltage,
controls the oscillator frequency,
change its value abruptly, since
ored as a charge by the cathode
components of the control tube.
time constant involved is nor-
made very much longer than the
n of a line, so that it is virtually
ble for the line frequency to
rratically from one line to the
except perhaps by reason of a
fault.
interference pulses may or may
d to the total current flowing
the control triode but, even if
, they can only add very slightly
control bias. No single line is
ed and, by the action already ex-
, the oscillator corrects the effect
ately.

H. RETAINED

versely, if an individual synch.
s lost or cancelled for any rea-
e oscillator does not lose synch.
succeeding line. The stored bias
cient to keep it in step and the
made up automatically immedi-
hereafter.
bypass capacitors are used in the
circuit for a particular reason.
gle large value would give the
ry long time constant but tend
uce some "hunting" when the os-
has had to make a significant
on. Its effect is therefore limited
ries resistor, the smaller capacitor
ing added to minimise very short-
ariations.
0.82 megohm resistor and 0.1
apacitor in the grid circuit of the
tube constitute a decoupling net-
o prevent oscillator signal from
mpressed on the grid and need-
mplified.
synchroguide is sometimes re-
as a rather critical or "cranky"
but it is, in fact, a very satis-
one if time-proven constants and
ues are followed.

The sawtooth feedback circuit shown will give the right order of reference pulse when the oscillator is set up to deliver the sawtooth amplitude shown in the waveform diagram. (100 volts p-p).

Similarly, the circuitry shown for the R. T. and H. receivers will give the right order of synch. pulse for satisfactory operation.

It is important to note in passing that the synch. pulses must be of uniform height and free from either modulation or cross-modulation by video or other components. The reason for this is that the synchroguide control tube is sensitive both to the timing and the amplitude of the input signals. Uniform and accurate synch. pulse clipping is therefore essential.

Assuming suitable basic circuitry, however, it is only necessary to wire the valve as indicated, then follow the simple setting-up procedure, to have the picture lock, and remain locked for all stations.

OUR attention has been drawn to an inadvertent error on page 121 of the July issue, in the DC compensation circuit for the 1958 TV Receiver. The lead shown as going to B-plus boost should simply go to the normal B-plus line.

The frequency can be brought within the locking range of the automatic control circuit by simply adjusting the core of the feedback transformer, as explained earlier. However, this is not a very good method mechanically and many designers have preferred to use a potentiometer in the plate circuit for line hold adjustment.

The core in the feedback transformer still has to be set, but it is done with the plate potentiometer at about the centre of its working range. Varying the potentiometer to either side of centre then varies the plate voltage, therefore, the plate and cathode current and, with it, the cathode voltage and line-blocking frequency.

The 15pF capacitor in parallel with the 0.15 megohm resistor affects the shape and phase of the sawtooth feedback pulse. Varying its value about the figure suggested tends to move the picture information relative to the raster and provides a very handy means of centring the picture on the screen, over and above use of the centring magnets round the tube neck.

In some receivers an additional pulse is brought back to the control tube grid from the line output transformer. This is intended to sharpen the reference pulse and facilitate comparison with the synch. pulse, but, in practice, does not appear to be very necessary.

AFFECTS INTERLACE

It normally involves additional cost and components while radiation from the relevant leads at line frequency can be an additional hazard to interlace by interaction with the frame oscillator.

The synchroguide can be made to lock the horizontal oscillator, even when its other adjustments are such as to produce a natural blocking frequency far removed from the nominal 15,625 Kc. In these circumstances, manipulation of the line hold control may produce little effect on the picture other than to move it slightly from one side to the other.

While, on the surface, this would appear to be an advantage, it may encourage the user to leave the control at an extreme setting and possibly introduce undesirable picture characteristics in other respects. It may also tend to confuse initial adjustment of the receiver by covering up marginal conditions.

Where the locking range tends to be excessive some designers prefer to reduce it by bypassing some of the synch. and reference pulse to earth. A variable trimmer connected between the control tube grid and earth will, therefore, serve as a "Locking Range" control. Alternatively, a selected value of fixed capacitor can be added to achieve the desired result.

The Horizontal Hold control can thus be made to lock over the centre portion of its travel, losing synch. or producing obvious tearing when turned to either extreme.

In practice, the Horizontal Hold control in a well designed synchroguide circuit may not need to be touched for months at a time.

(To be continued).

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NSWERS TO CORRESPONDENTS

Brighton, S.A.) is puzzled by the be- f his voltmeter when used to read the ltage on the IF amplifier. Readings the 250, 50, and 10-volt ranges bear n to each other, ranging from 90 volts 1.75 volts.

explanation is quite simple, F.W. The ltage is supplied through a series re- the voltage applied to the screen is on the current flow through the re- nce the meter will draw additional cur- gh this resistor the reading given is e one, but somewhat lower than it When using the 250 or 1,000-volt resistance of the meter is high enough o the dropping resistor to prevent the g serious. However, on the lower ranges ion of the dropping is completely upset reen no longer receives correct voltage the meter is not really inaccurate. The reads is that actually present, but bears tion to the voltage present when the removed. This problem is encountered cuit where high values of resistance are d, such as the plate and screen of a coupled stage, and which are usually e than the case you encountered. The ion is to use a more sensitive meter, 20,000 ohms per volt or a VTVM type

(Pinnaroo, S.A.) wants to fit a separate ntrol to an extension speaker and wants what size pot. to use.

ot, having a resistance of about 10 nominal voice coil impedance would be ssuming it is to be wired as a poten- nd not a simple series resistor.

Gulimba, Q.) is puzzled by an electric which he observed continuing to burn eak in the filament, though he knows useless, once switched off.

most likely explanation is that a small formed when the filament broke and able to maintain a circuit. We have is to happen quite frequently when operated on DC mains, though the lly destroys itself within a few minutes. that it is causing radio interference pport this theory.

Wentworthville, N.S.W.) wants to know ossible to provide continuously variable treble controls on an amplifier and also t is possible to attenuate various fre- n narrow channels over a fairly wide

have produced a number of control units fiers using continuously variable controls. rol Unit No. 7 (November, 1955), is a mple. The other problem is more diffi- have described a number of top-cut he past, designed to attenuate all fre- above a certain figure, but we are not whether this is what you require. In the existing designs would not cover the s you nominate. We would probably etter position to advise you if we knew at you were seeking to achieve. Frankly, ee little point in the idea from what told us so far, particularly as it would, e an expensive and complicated arrange-

Yarragen, Vic.) has constructed the two- nerative transistor receiver, and writes of its performance. He lists stations from nd South Australia, as well as the local

thanks for the report on this set, hich seems to be in line with others we ved, and suggest that this is an excel- set when correctly handled. In this ect, of course, it is like any other re- set, requiring a certain amount of prac- t the best out of it.

(Auburn, N.S.W.) wants to know if we lable any circuits of a three-stage tran- able of operating a speaker.

described one set along these lines, July, this was of an experimental nature and considered out of date by today's stan- he Two-Stage Regenerative set described 1957, would be a better proposition, is not designed for loudspeaker opera- more conventional receiver was described ust issue and we suggest that this would offer far better value for money than t types, although the latter are interest- a novelty point of view.

(Ingrove, Q.) is puzzled by the behaviour s in a car radio and the performance of ttle General.

most likely suggestion regarding the that it is gassy, but the makers would est people to advise on this, and we u return it to them for comment, though sarily for replacement. It would be or us to make anything but general as regarding the Little General set, since m obviously requires an examination of

G.L. (Carlton, Vic.) sends in a series of questions for the "Here's Your Answer, Tom" feature.

A. Thanks very much for your letter. Your list of queries is extensive and some are quite complicated so that we cannot promise to answer them all soon. However, we hope that it will be possible to work one or two in before too long.

K.W. (West Heidelberg, Vic.) is one of our younger readers who is interested in "Ham" radio and asks a number of questions on this subject.

A. Your questions are of a rather general nature, K.W., and it would be difficult to answer them without launching into a long discourse on the whole subject of Amateur Radio. We suggest that further study of your textbooks and the articles we are publishing from time to time on the subject should allow you to answer these questions for yourself, and in relation to your own requirements. We regret we cannot help in the matter of the cost of the Beginner's Four, but several of our advertisers would be happy to advise you on this point.

I.P. (The Rock, N.S.W.) has been using a pair of headphones across the speaker transformer secondary of his set and is worried by the deterioration of the headphone magnets and wants to know if this method of connection would be the cause.

A. No, I.P., we doubt very much that this would be the cause, and feel more inclined to suggest that it is simply old age. Most headphones are prone to this trouble over a period of years and the only solution is to have them remagnetised. However, it should be appreciated that the use of such phones in circuits where DC is flowing, as in the case of simple one and two valve sets, can result in de-magnetisation, if the phones are connected the wrong way round. One lead is usually marked in some way to indicate that it should connect to the positive terminal of the HT supply. The moving coil type phones available ex-disposals are capable of very good results, when fed from a low impedance circuit as, for example, a voice winding. They are not very suitable for crystal or other small sets unless fed through a step-down transformer. We suggest that, when using any kind of phones across the loudspeaker secondary, a resistor of approximately the same value as the voice coil be substituted for the latter.

R.J.G. (Magill, S.A.) is a new reader of the magazine and he suggests that he would like to see an article on the construction of an amplifier with from 5 to 10 watts' output and having reasonable performance consistent with moderate cost. He also expresses his appreciation of the recent Beginner's Set.

A. We have described various small and medium size amplifiers in the past which would probably suit you, R.J.G., and we could let you have copies of the circuits in most cases. Typical examples are the Crystal Pickup Amplifier of July, 1954, and the Low Cost Crystal Amplifier of February, 1957. However, we will keep your suggestion in mind when we are considering amplifiers again. Glad to hear that you liked the Beginner's Set.

In simple terms, it does not appear to have the sensitivity as others against which you have compared it, but it would be necessary to know what circuits were used for comparison before we would know whether the comparison was a valid one.

The most useful information is normally available during alignment when the overall sensitivity can be measured and compared with that of similar types of set. Any marked drop should be treated with suspicion and the signal generator used to determine which stage is lacking gain, and steps taken to correct it.

R.C.A. (Ascot, Q.) asks some questions concerning the Course in Television.

A. We feel that the above course is directed fairly well toward the beginner, as far as TV is concerned, but assumes a good knowledge of basic radio principles. We suggest "Basic Television" by Grob as a good companion textbook. Some back issues of the magazine are available but there is no reprint of this course available at present. It is difficult to predict the range of TV stations except in a general way, since the topography of the terrain is of major importance. However, distances of 50 to 100 miles are fairly commonplace in N.S.W. sometimes in spite of unfavourable terrain, while greater distances are covered with less reliability. Channel 2, in particular, has very good coverage. The electronic cooker is only another version of high frequency heating and diathermy, but we know of no constructional details readily available for the home constructor. The question concerning the solenoid is a rather general one, and we feel that it might be more correct to say that the operation of these devices from AC may not be very efficient. Many thanks for your comments about the magazine and we note your remarks concerning the beginners. We do our best in this regard, but, quite naturally, we have to strike a balance which will suit the majority of readers.

B.K. (Lower Ferntree Gully, Vic.) wishes to build the 1952 Junior Radiogram but wants to know if a 6A8 may be substituted for the 6AN7 and a 6AC7 for the 6M5.

A. There should be no reason why the 6A8 cannot be used provided there is space to accommodate it. The 6AC7 could also be used as an output valve in a manner similar to that used for the AC Economy Five (September, 1957). However, it should be appreciated that the performance of the 6AC7 will be considerably below that of the 6M5, particularly in the matter of power output. Its performance as a Radiogram may therefore be disappointing.

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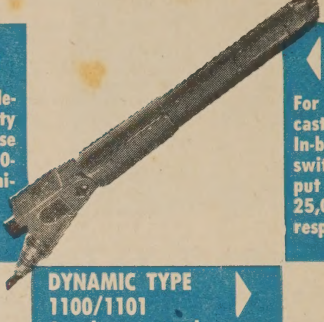

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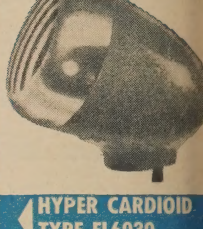

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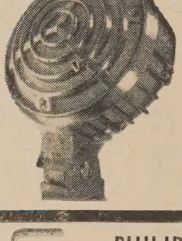

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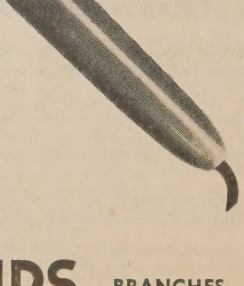

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ANSWERS CORRESPONDENTS

(Pennant Hills, N.S.W.) refers to a re- which has not yet been answered, and me additional points on the same sub-

r answer appeared in the September F., and you have doubtless seen it by unfortunate that queries are sometimes appearing in the magazine due to pres- ork, lack of space, etc., though we do o keep them as up to date as possible. ts concerning the EF50 are interesting, ur own experience has been that very ones have been found in disposals vertheless, this is a risk one normally disposals valves, and is one reason they eap. Many dealers have no facilities to the valves they have to offer, and sell e or less on the basis of "all faults, if feel that the dealer who replaced th es did all that could reasonably be ex- him, even though he may not have been legal obligation to do this.

Lakemba, N.S.W.) has used a crystal connection with a spring type gramo e pickup output feeds into a conven- alve receiver. A slight hum is apparent rmal playing position but, T.J.B. claims s not objectionable. However, when any gs on the turntable are touched while s playing the hum is sufficiently strong out the recording. T.J.B. wishes to cause of the hum as well as a remedy uld like to know how a crystal pickup

your description it is obvious that your lem arises from a lack or absence of The metal work as well as the earthy e pickup lead should be earthed at the assis. It should suffice to connect the k to the earthing braid on the pickup use this braid a common connection ceiver chassis. Should the pickup lead two conductors as well as the braiding, e conductors should also be connected ssis. The initial hum that you experienced hat the leads may have been connected way round.

elver chassis, too, should be earthed via pin of the mains supply plug. Carrying bove-mentioned precautions should cure without affecting in any way the re- you are getting.

ration of crystal devices such as a pick en covered in our Journal on a number ns, particularly in a fairly recent Answer re. However briefly, a slice of crystal d to mechanical stress by means of a hich a stylus is attached. The crystal is which generates a voltage when subjected nd this is fed to an amplifier for ampli- the usual way.

Liverpool, N.S.W.) is one of our novice o has just built himself a crystal set ts that the headphones he is using are d wants to know how to test them. asks several other questions on basic

can test your headphones by connect- across a single 1.5 volt torch cell A.W., uld produce a loud click on closing the d another when it is opened. No click. eak one, or bad crackling will all ults. The mark on the germanium diode ndicates the electrode equivalent to the n the case of a valve. It is of no e in a crystal set. We regret we can- in the matter of component prices, but aisers would be able to advise you. The method of reception is virtually uni- ay and all commercial sets employ this regardless of size. We suggest you read ers articles in the June, July, August ember issues which should give you nderstanding of many basic principles ies are available from our office if re-

st Month's Solution

E	R	L	O	A	D	I	N	G						
L		O		N	I	C	E			P	I			
E	C	T	R	O	D	E	S			A				
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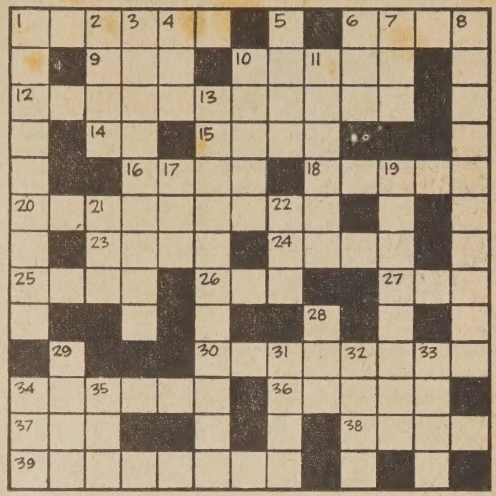
THE R., T.V. & H. CROSSWORD No. 54



ACROSS

1. An isolating stage in a transmitter.
6. To press with force.
9. Belonging to us.
10. Wind storms.
12. Level of objectionable sound in a receiver (2 words).
14. French for the (masc.).
15. Man's name (Russian).
16. Famous inventor.
18. Representation of a person.
20. Placing in a detached situation.
23. Wear—past tense.
24. Site of the Taj Mahal.
25. Hydrated silica of magnesia.
26. Rodent.
27. Prefix meaning three.
30. Earphones (2 words).
34. A colour.
36. Imaginary being.
37. The note of a dove.
38. Unit of force.
39. Technical qualification.

DOWN

1. Frequency coverage.
2. To frustrate.
3. Component of a distribution board. (2 words).
4. Before.
5. A dry, granulated starch.
6. By means of.
7. Utilise.
8. Circuit idea to minimise hum. (2 words).
10. Operatic tenor.
11. Enticing.
13. Filtering component (2 words).
17. Organ of hearing.
19. Supplies filament in battery set (2 words).
21. Nocturnal bird.
22. The grain of a cereal plant.
28. Girl's name.
29. Soon.
31. Far away.
32. The margin or edge.
33. River in England.
34. Frozen water.
35. Common domestic animal.

Solution and further crossword next month

A Battery Powered Portable Radiogram

(Continued from page 73)

3-8in ply is available may not always be readily obtainable. In this event, it is perfectly feasible to use ordinary ¼in long, 1-8in. Whitworth machine screws which will grip quite securely in wood if the correct "tapping" hole is drilled first. For most timbers this would appear to be 3/32in.

There is not much more that needs to be said from a constructional point of view, except to repeat the suggestion which we made at the beginning, namely, to read this article in conjunction with the "Transporta" articles in the August and September issues. If this is done there should be little chance of anyone encountering any serious difficulties.

Summing up, we think you will find this a most intriguing project. It is right up to the minute in techniques, yet is a conservative design intended to be a practical entertainment unit, rather than just a novelty. It should give you a lot of satisfaction to build it, and many hours of using it wherever you may care to take it.

"Smithy's" Transmitter Now In Museum

(Continued from page 59)

ed from the plane and, in due course, the H and K transmitter, together with the air-driven generator, was lodged as an indication of good faith at a motor garage in one of Sydney's northern suburbs.

There it lay for many years, until it was bought by Mr M. A. Brown, now General Manager of Mullard Aust. Pty. Ltd. He kept it in his "Ham Shack" for as many years again, until plans were finalised to house the "Southern Cross" at Eagle Farm airport.

Mr Brown duly had the transmitter cleaned up and restored to its original condition so that it could be re-installed in its rightful place — in Smithy's "Old Bus."

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WANTED TO BUY, SELL OR EXCHANG

Advertisements for this column should reach us one month before the date of issue and cost 3/3 per line. There are approximately seven words per line.

FOR SALE: Hi-Fi demo and trade-in equipment Magnavox 12 WR, £5/15/; Peerless Coaxial 12in, £12; Goodmans Trebax tweeter, new, £9.15/; American Electrovoice 12in 12TRXB Triaxial 3 way speaker, demo, £38; Goodmans axiom MK11, £29; Verdik amplifier and control, demo only £39; Sherwood walnut speaker cabinets, £20; Collaro 2010 3 speed transcription player, new, £26; Ibbott 360 tweeter, £1/10/; Connisseur trans. turntable, new, £41/10/. **Amplasound Co., 126 Buckingham Street, Sydney. XJ4193.**

FOR SALE: T.V. test equipment, as new: FS4A klein and hummel telecast pattern generator. 1323A cossar telecheck and market generator. Radio corporation. T.V.—1 oscilloscope. **Enquire Audiphone, 140 Castlereagh Street, Sydney. MA4924.**

FOR SALE: Model Engineering Supplies. Gears cut to order. **Bolton, 72 King St., Sydney.** Model Catalogue, 5/6.

FOR SALE: Back Nos. R. and H. for sale, April, 1939 to Oct., 1956, 2/ posted. Nov., 1956, to current copies, 3/ posted; quote on large lots, also will buy spare R. and H. you have. If out of stock, I will get it for you. **A. J. Cox, 13 Glover St., Belmont, N.S.W.**

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SELL: Receiver type AR88D range 540 kc to 32 mcs 110 or 220 volt. Plus speaker, circuit and handbook. Price £70. **28 Verbena Avenue, Bankstown.**

SELL: Every back issue R.T.V. and H. always in stock. 2/ per copy,, two or more copies 1/6 ea. Jan., 1957, to date, 3/ ea. All prices include postage. **T. Weir, 56 O'Connor St., Haberfield, Sydney, N.S.W.** For inquiries or quantity quotes or if you have copies to sell, please ring UA2569 any time.

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